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The Role of the Cancer Clinic in Cancer Control[1]

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I AM DEEPLY appreciative of the honor of the invitation to speak today on the subject which holds first place among my professional interests—the role of the cancer clinic in the cancer control problem.

In 1929 a committee of the American Society for the Control of Cancer pointed out the logic of the establishment of cancer clinics in the general hospitals throughout the country to bring within reach of the entire population the benefits of contemporaneous knowledge of the disease. The necessity for co-operation in these clinics of a group of doctors, each of whom has training and experience in an individual phase of cancer, was definitely shown. The American College of Surgeons wholeheartedly and enthusiastically undertook the leadership in promoting the formation of these clinics and has maintained this position until the present time. The *Minimum Standard* for such clinics was established and was favorably received. There are now more than 380 clinics that meet this standard, and through these some 80,000 cancer patients pass annually. The clinics are well distributed from the geographic standpoint. The College shares the credit for this accomplishment with many other organizations and individuals. Enthusiastic support has been given by the American Society for the Control of Cancer and its Women's Field Army, by the National Cancer Institute, by state and county medical societies and health departments, by special legislative commissions, and especially by interested members of hospital staffs throughout the country. Surgeons, radiologists, pathologists, internists, and hospital administrators with their lay staffs have co-operated in this work. In fact, co-operation has been and must be the keynote of success.

Since the inception of this program the number of cancer committees appointed by state and local societies has greatly increased, health departments have established Cancer Divisions, governors of states have appointed special Cancer Commissions, and the whole problem has been approached in a much more logical and better organized manner. One can really derive some satisfaction from looking back over the past ten years. During this period there has been an increasing number of five-year cures reported. *But* the *annual* cancer mortality is constantly increasing. While we like to believe that it is not increasing so rapidly as it would have done had this determined effort toward its control not been exerted, there is an imperative call to extend our efforts. Twenty-five per cent of the general hospitals of one hundred beds or more conduct cancer

[1] Presented, as part of a Symposium on Tumor Clinics in General Hospitals, before the Radiological Society of North America, at the Twenty-eighth Annual Meeting, Chicago, Ill., Nov. 30–Dec. 4, 1942.

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Minimum Standard for Cancer Clinics

1. ORGANIZATION. There shall be a definite organization of the service, and it shall include an executive officer and representatives of all the departments of the hospital concerned in the diagnosis and treatment of cancer. The services of a secretary and of a social service worker shall be available for the purposes of the clinic.

2. CONFERENCES. As an essential feature of the service there shall be regular conferences or consultations at which the diagnosis and treatment of the individual cases are discussed by all members of the clinic who are concerned with the case.

3. PATIENTS. Reference to the cancer clinic of all patients in whom the diagnosis or treatment of cancer is to be considered shall be either voluntary or obligatory in accordance with the vote of the medical staff or of the governing board of the hospital.

4. EQUIPMENT. In addition to the diagnostic and therapeutic surgical equipment which is required in every approved general hospital there shall be available an apparatus for x-ray therapy of an effectiveness which is generally agreed upon as adequate, and an amount of radium sufficient to insure effective treatment.

5. RECORDS. In addition to the records which are required in every approved general hospital, there shall be additional records of: (a) Details of the history and of the examination for cancer in different regions of the body, such as are indicated on the form records which are recommended by the Cancer Committee, American College of Surgeons; (b) Details of the treatment by radium or x-ray as indicated on the form records which are recommended by the Cancer Committee, American College of Surgeons; (c) Periodic examinations at intervals for a period of at least five years following treatment.

6. TREATMENT. The treatment of cancer patients shall be entrusted to the members of the staff of the cancer clinic except in cases in which adequate treatment in accordance with the collective recommendation of the staff of the cancer clinic can be procured otherwise.

clinics, but our goal of having them within easy reach of all the population will require clinics in over 40 per cent of the hospitals.

The advantages to be derived from the organization of such clinics have been stated frequently and have been amply demonstrated but need restatement at frequent intervals. Among the more important benefits are

(1) Concentration of interest in the study of cancer by a selected group of the hospital staff, and the consequent greater knowledge of the problems involved in the diagnosis and therapy of the disease.
(2) Pooling of the knowledge of those versed in different phases of cancer work, to the end that each patient may not be deprived of the benefits to which he or she is entitled.
(3) The educational opportunity that is offered to individual members of the staffs of cancer clinics, to visiting physicians, and to medical students in training.
(4) The standardization of records so as to make possible statistical studies of end-results in large numbers based on comparable data.
(5) Concentration of material for clinical research to supplement and implement the new principles which are discovered in the laboratories of research in pure science.
(6) The greater ease of securing financial support and the co-operation of lay individuals and organizations in furnishing equipment and clerical and nursing aids, non-professional technical aids, and transportation of patients.

Personal surveys of all the cancer clinics by trained professional personnel have made increasingly obvious the essential importance of certain principles that require repeated emphasis. These principles are all contained in the *Minimum Standard*, reproduced on the opposite page. They are all fundamental to success, but they are not always adhered to with a precision sufficient to produce the greatest benefits from the clinics.

The *Standard* requires that there shall be a definite organization of the service and it shall include an executive officer and representatives of all of the departments of the hospital which are concerned in the diagnosis and treatment of cancer. As an essential feature of the service there shall be regular conferences or consultations at which the diagnosis and treatment of the individual cases are discussed by all members of the clinic who are concerned with the case. There are no superfluous words in that statement, but too often it is found that a hospital thinks that it has established a cancer clinic when a competent department of radiation therapy has been organized. Such a department is, of course, an essential, but in addition there should be, through the medium of a regularly organized cancer clinic, a close co-operation between the department of radiology, that of pathology, and those of general surgery and of the surgical specialties. Conclusions as to the type, or types, of therapy to be employed in the individual case should be the result of a group discussion. Thus will be ensured a safeguard to the patient from the over-enthusiasm of any one of the specialists. An unbalancing predominance of any one department does not guarantee the best results. When the type of therapy is decided upon, it is to be expected that the patient will be referred to that department of the hospital best equipped to furnish that treatment. In the case of private patients the clinic has discharged its duties when it furnishes to the referring physician a record of the collective opinion of the staff of the clinic. This procedure is necessary in order to protect the clinic from an accusation of interfering between the physician and his patient.

Our surveys have also brought out the fact that many hospitals are not deriving the fullest possible benefit from existing clinics, as only a small percentage of the cancer patients that enter the hospital are referred to the clinic, the remainder being held on the services to which they were

admitted. Some of the advantages from the clinic may be obtained from these cases if at least their records be made available to the clinic and follow-ups be established and recorded through it.

There is an increasing demand for more cancer clinics and hospital beds for indigent cases. The cancer educational program among the laity is robbed of many of its fruits by the lack of such clinics. The Women's Field Army and Visiting Nurses are frequently embarrassed when asked how cancer preventive measures and cancer diagnostic services may be obtained.

Today's universal preoccupation with the war should not be allowed to retard the cancer-control program. Conservation of man power for war industries and civilian defense constitutes an integral part of the nation's planning, and the object of cancer control is such conservation. It has been abundantly proved that, as Doctor Hektoen has pointed out, cancer is the most curable of all the diseases that are listed among the major causes of death. This presupposes, of course, that cases reach the physician and are accurately diagnosed and adequately treated in the early stages of the disease. I have previously drawn attention to the fact that, at present mortality rates, one and a half million persons will die from cancer within the next ten years in the United States. Surely no effort to reduce those rates should be spared. Concretely, military service has deprived a number of cancer clinics of their key men. It is our hope that the framework of the clinics will be maintained by those who remain behind and that the ground gained by many years of effort will not be abandoned to the enemy.

In closing, may I take this opportunity of paying my respects to the radiologists of the country and acknowledging the all important role that they are playing in the cancer clinic program. I believe that cancer is still primarily a surgical disease, but the help that is being rendered by radiation therapists is recognized by all.

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Experiences and Results in Tumor Clinic Organization in New York State[1]

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THIRTY YEARS ago, not many hospitals possessed a diagnostic x-ray department. Today few hospitals, even the smallest, lack one. The medical profession, the hospitals, and the people have demanded that the cancer patient receive adequate diagnosis and treatment. The tumor clinic is an important part of the answer to that demand. The tumor clinic idea, aggressively launched by the American College of Surgeons in 1930, is gaining momentum. We venture to predict that the time will come when, just as it today possesses an x-ray department, every general hospital will provide a tumor clinic as part of its service.

The experience of upstate New York, with its population of over six million persons living in communities ranging from the highly urban to the most rural, is offered, not as a model, but as a sample of the conditions and problems which may be encountered by those interested in organizing and maintaining tumor clinics. In this area annually occur over 9,000 deaths from cancer. Last year, in the office of its Division of Cancer Control, there were recorded reports on 29,205 living cancer patients known to the medical profession during the year. How best to provide care for these patients and how to bring them under treatment at the earliest stage represents, in its simplest terms, the cancer problem.

In meeting this problem, the tumor clinic has long been a potent weapon in upstate New York. It received increased emphasis in 1937, when a Commission was appointed by the state legislature to study the cancer situation as it existed in the state, to examine the facilities available, and to make recommendations as to how the problem could best be attacked. Under the able guidance of Dr. James Ewing, Dr. Edward S. Godfrey, Jr., State Health Commissioner, and Dr. Floyd S. Winslow, past president of the New York State Medical Society, this Commission submitted, after two years of study, a report containing specific recommendations. Chief of these was that, in meeting the needs of the cancer patient, the fullest encouragement be given to tumor clinics organized in general hospitals. On the basis of the Commission's report, legislation was enacted reorganizing the Division of Cancer Control and making cancer a reportable disease. Among the functions of the Division as set forth in the law are: the conduct of both professional and public education, the statistical analysis of reports from physicians, hospitals, and laboratories, and the encouragement of general hospitals throughout the state to establish and maintain tumor clinics of the highest standard. The legislation does not apply to New York City, which is a separate administrative area as regards public health.

At the time this program was launched, late in 1939, there were already in existence 23 active tumor clinics in the upstate area. In addition to these facilities, there was the state-owned and maintained cancer hospital, the State Institute for the Study of Malignant Diseases. Besides laboratory service and research activities, this Institute has since 1913 furnished clinical care to cancer patients. Its location in Buffalo, however, at the western tip of the state, over 300 miles from the eastern border, poses a difficult problem in transportation, even were its 100-bed capacity adequate. As might be expected, the

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majority of the patients seen at the Institute come from the western half of the state. In addition, there is sound reason to believe that the shorter the distance the cancer patient must travel for diagnosis, the greater are the chances that the diagnosis will be made early. No one questioned the necessity for tumor clinics.

In encouraging the organization of new clinics, special effort was given, of course, to areas where none already existed. The goal was that tumor clinic service should be obtainable, within a maximum distance of 50 miles, by every person in the upstate area. It is reasonable to believe that with such service available there should occur a gradual but continued improvement in early diagnosis and an increase in the percentage of clinical cures. There are now 37 tumor clinics actively functioning in upstate New York. All but 4 per cent of the population are within 30 miles distance of a clinic. Some sections of the state, however, still lack this service. Several hospitals in such sections, which had planned to organize clinics, have had to defer their plans because of the war.

ADVANTAGES OF A TUMOR CLINIC

In organizing a tumor clinic, it is obviously important that the medical profession in the area, and especially the staff of the hospital, should be favorably disposed toward it and be willing to lend it active support. Often the need for such a clinic may be recognized by only a few staff members. On them must fall the task of convincing their colleagues and arousing their interest. They can do this by pointing to the many advantages which an adequate clinic offers to the practising physician and the hospital as well as to the patient.

To the practising physician, the tumor clinic offers (1) group consultation for difficult or troublesome cases; (2) the opportunity to profit by observing the cases of many other physicians; (3) opportunity to keep abreast of modern methods of therapy and to judge for himself the results obtained; (4) a means of retaining under his professional care patients who might tend to go to other communities where consultative service is available.

To the hospital, a well run tumor clinic undoubtedly brings added prestige. Experience has shown, too, that almost invariably a tumor clinic brings added revenue to the diagnostic as well as the therapeutic radiological departments of the hospital, and that it results in increased percentage of hospital occupancy. These results are not matters of conjecture; they can readily be demonstrated by the experience of other hospitals which have established tumor clinics. They are considerations which carry considerable weight with hospital boards and hospital superintendents.

The possibility of having too many tumor clinics in one community must also be considered. In a small city containing two general hospitals, it is often impractical to establish clinics in both, and yet difficult to get the staff of either to agree to support a clinic in the other hospital. In one community in our state this situation has, up to the present, led to a deadlock, prevented the establishment of a tumor clinic, and deprived the community of tumor clinic service. On the other hand, in another small town, serving a county of approximately 70,000 population, there are now two active tumor clinics in successful operation. In still another community the superintendent of the local hospital opposed the organization of a tumor clinic. A group of physicians then established one in the local city hall, whereupon the superintendent relented, and today a successful clinic is in operation in that hospital.

STATEMENT OF ORGANIZATION AND FUNCTIONS

Once the decision to form a tumor clinic has been reached, a great deal of careful planning should go into the matter of organization and personnel. A device which has been found useful in several clinics is that of drawing up a precise statement regarding the organization and the

functions of the clinic. Many loose ends are thereby uncovered and opportunity is created for clarifying the relations of the clinic with other departments of the hospital and with other community agencies.

PERSONNEL OF THE TUMOR CLINIC

The nucleus of the tumor clinic staff should include a radiologist, a pathologist, a surgeon, and an internist. One of these should serve as the director, who should be a leader, an organizer, and a diplomat. It is of definite advantage to have as director some member of the staff who is not engaged in private practice, such as the pathologist. This is not, however, invariably desirable or necessary.

One danger which must be guarded against is the employment, as consultant, of a physician who, although thoroughly trained and entirely competent to conduct the clinic, is not interested in teaching or in the group consultation phase of clinic service. Such a consultant may unwittingly develop a "one-man clinic" with corresponding atrophy of the teaching and group consultation aspects which are so important to a growing tumor clinic service.

In choosing personnel, it is important to select a nurse who is interested in the clinic. She should know which patients are scheduled to attend each session and follow up those who fail to appear. She should see every patient before he leaves, in order to check appointments for future attendance and to review with him the medical advice he has received, making certain that this is understood. If the patient is in need of social service, the nurse should be able to refer him to the proper agency.

Pathologists are difficult to obtain. This problem may sometimes be met by having the same pathologist serve two or more clinics. One of the pathologists in our state serves three hospitals, giving each table diagnosis service by arranging to be at the hospital when such service may be needed. With careful planning of operative schedules, one pathologist can competently serve several hospitals in the same community in all but emergency situations.

Disagreements and friction may at times arise between members of the tumor clinic and those not on the clinic staff. This may be prevented by inviting all members of the hospital staff to attend the tumor clinic session and to participate in the discussion of each case. While it may be said that mere membership in the tumor clinic staff does not confer expert knowledge of cancer, it will soon be found that the experience afforded by such a position does have that effect. Moreover, no one man can claim expertness in all the branches of knowledge pertaining to cancer. It is precisely for that reason that a tumor clinic must be conducted on the basis of group consultation and not as a one-man affair.

CLINIC RECORDS

The matter of clinic records merits serious consideration. The forms devised by the American College of Surgeons are recommended. In some clinics it is felt that these record-forms are too detailed, or that there is not sufficient time to fill them out completely. On the other hand, some clinics use their own record-forms in addition to those of the American College of Surgeons. The records of all cancer patients admitted to the hospital, private patients included, should be available to the tumor clinic. The complete record, including that relating to radiation therapy, should be at hand when the patient appears for observation or check-up. Although some radiologists believe that the radiation therapy record is not needed for the general folder, it is our view that having this record on hand serves to increase familiarity with radiological problems and makes for better understanding and cooperation in treatment.

A highly important aspect of the record system is that it should facilitate follow-up. We have found, time and again, that unless a systematic check is instituted, patients are lost from observation without the clinic staff becoming aware of it. It

has been found in such instances that patients have failed to complete a prescribed course of radiation therapy, failed to return for diagnostic procedures, or failed to return for treatment after the diagnosis of cancer was made, without any further follow-up or attempt to apprise them of the danger of delay. Many plans have been devised for maintaining close supervision over the follow-up of patients, and the Division of Cancer Control has been keenly interested in aiding each tumor clinic to institute the system best adapted to serve its particular needs.

MEETING TIME

No rule can be set for the clinic's meeting time, but considerable thought should be given it. The hour of meeting should be that which will enable the largest number of physicians to attend. The number of meetings per week or month will depend on the case load. Some of the large clinics meet four times a week, smaller ones twice a month. This is a matter which must be governed by local circumstances. The chief of the surgical staff of one hospital will not allow any except emergency operations to be scheduled during the tumor clinic hour. In many clinics the schedule of cases is posted on the bulletin board for the information of the staff and as a reminder of the meeting.

PATIENTS ADMITTED

The type of patient to be admitted to the clinic and the question of fees are another perplexing problem. Opinion is divided as to whether or not patients must be referred by a physician. Advocates for both sides are numerous, but, for the most part, clinics insist that patients be referred by a practising physician. One clinic has cards for use by the physician in referring a patient. These provide space for the patient's name, address, and age, name and address of the referring physician, brief résumé of the history, and a statement as to whether a biopsy, x-ray examination, or Wassermann test should be done, and whether treatment should be instituted. In some hospitals, every tumor patient admitted to the institution is seen by the tumor clinic staff. This is more apt to occur in municipally owned hospitals, where private patients are few.

In caring for indigent patients, most clinics make no charge for diagnosis or rendering an opinion. If, however, treatment is given such patients, payment is made through the local welfare commissioner. In many instances, the hospitals have assumed this responsibility. There should be close co-operation between the welfare department and the tumor clinic so that adequate care may be assured the indigent patient.

RELATION OF CLINICS TO THE DIVISION OF CANCER CONTROL

The Division of Cancer Control exercises no control over the clinics in upstate New York, and its relationship to them rests on a purely voluntary basis. That is to say, the Division may give aid and advice when called upon, but not otherwise. The entire program has received the sanction and hearty co-operation of the Medical Society of the State of New York, especially since one of its aims is to keep the care of the cancer patient in the hands of the practising physician. Through state funds, clinics may receive a small amount of clinical and clerical aid. The clinical aid is rendered by a physician, who prepares the history and performs the physical examination and any desirable laboratory examination before the patient is presented at the tumor clinic session. This saves the time of the busy practitioners who comprise the tumor clinic staff and leads to greater interest and a more smoothly functioning clinic. This clinician receives ten dollars per session and is appointed by the tumor clinic staff, which also prescribes his duties. The clerical aid consists in provision of state funds to the hospital for the services of a clerk to serve the tumor clinic. This person is usually an employee of the hospital, desirous of extra work after regular hours. The amount of this aid is set at a maximum of forty-eight hours a month at

forty cents an hour, making a total of $19.20 per month. The clerk's duties are prescribed and his work is supervised by the tumor clinic staff. A clinic consultant of neoplastic diseases is also available. He is employed on a part-time basis by the Division of Cancer Control. His services are available to aid tumor clinic staffs in meeting the more difficult problems of diagnosis and treatment. As time goes on, it is hoped that the need for a consultant will grow progressively less frequent. This consultation service does not in any way obligate the clinic to the Division of Cancer Control. (At present, it is difficult to obtain such personnel, because of the inroads made by military demands.)

STANDARDS

The minimum standards for tumor clinics as set forth by the American College of Surgeons are recommended to all clinics in the state. Of the 37 clinics now in operation, 27 are fully approved by the College, 2 are provisionally approved, 2 are approved for diagnosis, and 6 are not as yet approved. One of our objectives is to aid clinics to attain the degree of completeness in service and organization that merits full approval. At the same time, plans for more detailed and comprehensive standards than those of the American College of Surgeons have been drawn up and have been endorsed by leaders of the profession in our state. We do not, however, consider the time propitious for efforts to raise clinics beyond the present standards of the American College of Surgeons.

FACILITIES FOR RADIATION THERAPY

With a few exceptions, facilities for deep x-ray therapy are available to all our clinics. There is a lack, however, of facilities for radium therapy. A few clinics own sufficient radium to meet most of their needs, and a few clinics are able to borrow radium from one of the large cancer centers in New York City. In two counties, the local Cancer Committees have purchased radium and made it available to every clinic in these counties. The National Cancer Institute has loaned radium to four other clinics in upstate New York. Radon seeds for the most part are obtainable only by purchase from commercial sources. The Division of Cancer Control has under consideration a plan to make radon available to approved tumor clinics without cost. This is a difficult problem and presents many obstacles, but we feel that there is a real need for radon seeds in most clinics and that this need should be met.

TUMOR CLINIC ASSOCIATION

One of the promising developments in furthering the tumor clinic program has been the organization of a Tumor Clinic Association, composed of members of the staffs of the various tumor clinics and others elected to membership by the council. The purpose of the Association is to facilitate the exchange of ideas for improvement of tumor clinic service. The officers and council represent all sections of the state, both urban and rural, and clinics of various sizes. This organization is interested in every type of problem confronting tumor clinics and has done much toward formulating policy to govern the conduct and activity of these clinics. This Association recently sponsored a Cancer Teaching Day, open to all physicians in the state and held at the School of Medicine of Syracuse University. At the last meeting of the State Medical Society, the Association sponsored and conducted both an afternoon and an evening meeting. In the future, this Association should serve to strengthen the tumor clinic movement throughout the state.

CONCLUSION

The New York State program has been the means of stimulating the formation of new tumor clinics and of improving the facilities available to those already established. It has fostered postgraduate education in cancer. Facilities for the diagnosis and treatment of cancer have been brought within easier reach of the patient. Many

hospitals are better equipped to cope with cancer today than ever before. We believe the program has helped maintain the control of the cancer case in the hands of the practising physician. In many instances, it has completed the service to the community offered by the local hospital. It is hoped that it may be instrumental in saving many lives.

With the radical changes in the conditions of medical practice brought on by the war, the tumor clinic—in common with other medical agencies—faces new problems, new difficulties, and new opportunities. In meeting these new conditions, our goal must continue to be, as in the past, to make it possible for every cancer patient, rich or poor, to obtain prompt diagnosis and adequate treatment of his disease.

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The Role of the Surgeon in the Tumor Clinic[1]

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TO DESCRIBE THE status and evaluate the responsibilities of the surgeon on the tumor clinic staff, it is necessary to survey the services a tumor clinic must render. Aside from social, economic, and psychic problems, the chief services concern diagnosis and diagnostic procedures, indications for specific therapy, the performance of therapeutic procedures, and adequate follow-up.

DIAGNOSIS AND DIAGNOSTIC PROCEDURES

I have an increasingly strong conviction that much of the descriptive matter in our textbooks, relative to the symptoms and diagnosis of malignant growth, will have to be completely revised. Carcinoma must be diagnosed early in its course if we hope to combat it successfully either by surgery or irradiation; yet we can read daily of the symptoms and diagnostic signs presented by far-advanced cancer. If we wait until the cardinal symptoms become manifest, the case is hopeless. As an example, many medical students and practising physicians attribute great significance to the presence of axillary nodes associated with a breast tumor as indicative of malignant growth and their absence as against a diagnosis of cancer. We see so many instances of delay—waiting for a tumor to infiltrate, attach itself to the skin or underlying tissue, or grow progressively—before it dawns upon the observer that the process is malignant. I know of a well qualified internist who with a caliper measured the size of a breast tumor at intervals. When, after a period of time, he became convinced that the tumor was steadily increasing in size he decided that it was probably malignant. When at last the patient was referred to the surgeon the carcinoma was so far advanced that the prognosis was very poor.

The signs and symptoms of the primary lesion must be stressed, not those of its complications or metastases. In many instances the nature of the lesion—or even its presence—must be proved; therefore, an early exposure for direct study must be made on suspicion only, in the hope that if the growth is malignant an early diagnosis may be made and therapy applied in a curable stage.

Naturally many operations will appear needless, but when results are carefully analyzed it will become equally apparent that the operation is a definite diagnostic test and, while it may be time-consuming and expensive, in the end it holds the hope, in many instances, of being not only a means of diagnosis but a curative measure. In most instances the exploratory procedure is devoid of danger and the effort is warranted because of the increasing number of early diagnoses resulting and the many lives saved. The medical profession must be made aware and the laity convinced of the truth of this conception. This line of approach to mammary tumors is in common usage today and fortunately the lay population is gradually realizing that a breast tumor is dangerous and should be removed and examined.

The direct diagnostic approach should, however, in no wise curtail other diagnostic studies. The surgeon needs all the information possible to assist him in his operative approach and interpretation of the findings. Often the exploratory laparotomy is far from simple, and the earlier and smaller the lesion the more difficult it is to find and to recognize. Even at autopsy, with the abdomen open from

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symphysis to the ensiform process and with many of the contents delivered out of the abdominal cavity, the pathologist at times has difficulty in locating or recognizing a lesion that the surgeon is supposed to find and recognize through a limited laparotomy wound. This fact was dramatically impressed upon me several years ago while observing the autopsy in a case in which I had operated. The liver was removed and grossly appeared to be normal. It presented no evidence to attract the attention of either the pathologist or myself. When, however, the organ was routinely sectioned, an abscess about 4 inches in diameter was found. How possibly could the surgeon recognize this lesion when the liver was attached high under the costal margin in the living patient?

I would like, at this point, to elaborate upon a problem that confronts the surgeon almost daily, that is, the desire of his associates to have him do, we will say, an exploratory laparotomy. To take a condition with which you are familiar, I shall mention the differential diagnosis between carcinoma of the colon and diverticulitis or multiple diverticula in the vicinity of the bowel. That is an extremely difficult problem when the abdomen is open. It is an impressive illustration of the fact that the surgeon should work in much closer co-operation with the radiologist, especially in the study and evaluation of films.

Personally, I have a conviction that in such a case the surgeon should in no instance explore the abdomen unless he has gone over the details with the radiologist, has himself become familiar with the films —the possibilities and probabilities—and has tried to co-ordinate the radiological study and the findings obtained by physical examination and a carefully taken clinical history. I think that such considerations will often be of more significance in reaching a decision, after the abdomen is open, than any specific type of pathology that can be recognized.

In surveying the diagnostic problem it is apparent that a neoplastic process may involve any organ or tissue of the body. The diagnostic procedures in many instances may be quite complicated and require special skill and equipment. A grouping may be suggested to clarify the view taken.

1. *Totally Exposed Lesions:* This group consists essentially of skin lesions that can be seen and palpated. Since skin cancer must be differentiated from other skin lesions, the services of a dermatologist are desirable. Biopsy is simple and decides the question finally. The services of a surgeon who sees many skin lesions requiring excision are also required. He should have become proficient, if he has utilized his past experiences by verifying diagnoses through study of gross and microscopic pathologic specimens. In this group, also, must be placed lesions of the oral cavity. Such tumors exhibit rather characteristic findings but require skill and special training for the detection of their nature. Many of these lesions are on the surface; others, however, may be concealed and fall actually in group 2. Among these may be mentioned adamantinoma and other neoplasms growing from the tooth and its appendages and certain tumors peculiar to the jaw. In this group, also, may be placed the bizarre type of tumor arising from the salivary glands. The more we see of these, the more we expect to see them. Recently a small tumor removed from just below the nose was found microscopically to be of this type. It is thus obvious that the oral surgeon becomes a valuable asset to the clinic not only for diagnostic reasons but also for his ability to cope with problems of treatment.

Areas that deserve more attention than they generally receive are the nasopharynx, pharynx, and larynx. These regions are frequently the site of primary malignant tumors that may cause little subjective disturbance in the early stages. Frequently the metastatic manifestations are first to attract attention. In the presence of neck tumors the diagnostic study is not complete until a most meticulous survey of the nose, nasopharynx,

pharynx, and larynx has been made. If the suspicion is constantly entertained in such cases, it is surprising how frequently there will be found a small primary malignant lesion behind a faucial pillar, in the substance of the tonsil without superficial ulceration, in the nasopharynx, or in the larynx. For this group it is necessary to enlist the services of a competent oto-laryngologist who, fully comprehending the situation, will devote sufficient time, energy, and skill to delve into the problem of each individual case.

This last statement may well receive special emphasis. Recently there was sent to our Clinic a man with a tumor of the neck. Though the case had been referred to us as a primary neoplasm of the neck, we discovered a suspicious lesion in the larynx and returned the patient to the Department of Otolaryngology, where the original diagnosis had been made, with the result that a laryngeal carcinoma was discovered. This example indicates that the search for a small malignant lesion of the larynx or nasopharynx is a study in itself—not included in a routine examination of these areas.

2. Intermediary Lesions: In this group are placed those lesions that can be seen through special diagnostic instruments or can be felt. Among the former may be mentioned tumors of the bladder, which may be observed through the cystoscope, lesions of the esophagus that may be quite definitely recognized radiologically but should be studied directly by use of the esophagoscope and biopsy, and high rectal and sigmoid lesions requiring proctoscopy or sigmoidoscopy for direct visualization and biopsy. To these may be added stomach lesions, for which the gastroscope has recently become available. The concealed lesions that can be felt but not seen comprise a large group, centering about the breast and abdomen. There seems no question that the surgeon who has availed himself of the opportunity of carefully examining breast tumors, subsequently removing them, and then with equal care studying them from the pathologic point of view is in a better position to offer a logical diagnostic opinion than any member of the tumor clinic staff who has not had such specific training. This applies likewise to intra-abdominal lesions. These lesions require many diagnostic procedures, especially radiologic study. The latter, when conducted by an experienced and well trained radiologist, will offer very definite evidence, but there must be, also, the clinician who will co-ordinate the radiologic and physical findings with the clinical history and frequently, in addition, the surgeon to explore.

In this field the surgeon should find his greatest usefulness. Issue may be taken on the question of the surgeon's ability to diagnose accurately intra-abdominal cancer, on the ground that the internist is better qualified. This subject is debatable, but I feel I am correct in believing that the surgeon who studies and treats surgically many such cases is far more alert to the subject than the internist, who sees probably many cases of transitory gastro-intestinal episodes in which no intensive diagnostic studies are made and recovery ensues within a few days or a week. The difference is probably that the surgeon is always cancer-minded while the internist, as a rule, is not.

3. The Concealed Lesion: This group can be subdivided into two parts: lesions in which some more or less specific localized evidence can be obtained by radiologic study, such as intrathoracic tumors, and those that present only subjective symptoms with, at times, objective evidence of altered function or secondary manifestations. This latter group can be best illustrated by the jaundiced patient. Here again the utmost skill, based upon previous experience, is required for proper evaluation of the clinical history, physical findings, and laboratory data. The well qualified surgeon is usually the one that is called upon to decide the issue and to advise the type of therapy.

From this brief survey of diagnosis it becomes quite obvious that the adequately staffed tumor clinic must have a well diver-

sified personnel. Aside from the radiologist, the pathologist, the internist, and the dermatologist, the surgical group should include an oto-laryngologist, a urologist, a gynecologist, an oral surgeon and a general surgeon.

A word may be said about the association between the clinical staff of a tumor clinic and the pathologist. Too rarely, I believe, is the pathologist taken closely enough into the diagnostic team. He is often considered an abstract member of the staff, competent to pass only upon morbid tissues removed and to view the microscopic slides. The well functioning clinic should welcome the pathologist to participation in the examination of the patient and in the evaluation of the data obtained. He is especially competent to decide the site of the biopsy and should be allowed to examine the tissue before it is placed in the fixing solution if he so desires.

THERAPEUTIC INDICATIONS

There is no phase of work in the tumor clinic more important than that of deciding upon the therapeutic procedure for the individual case. Unbiased team work is essential. It must be determined whether treatment is to be curative or palliative. Definitely more liberty may be taken with the curative than the palliative procedure and the type may vary materially. Treatment may consist of irradiation in any of its various forms, surgery, or a combination of the two. This means that the surgeon must be familiar with the possibilities of irradiation therapy; likewise, the radiologist must know the value of and indications for surgical therapy. Both radiologist and surgeon should be conscious of their limitations. For the welfare of the patient this must be so. It is unnecessary to say here that the ready availability of either irradiation or surgical facilities should not control the issue. Conditions may arise in some communities where such may be the case, but this certainly should not affect the decision in any well staffed and well equipped tumor clinic.

TREATMENT

If it is decided that an individual case demands surgical therapy, the details of administration of such therapy will depend upon several factors. The large clinic should have available a corps of surgical specialists so that the cases may be assigned to the various special services: eye cases to the ophthalmologist, pelvic cases to the gynecologist, and the like. Aside from this group of special cases there will remain a rather large collection to be taken care of by the general surgeon. To cope with his problem, he must have experience in all phases of surgery. Not infrequently he is asked to stand by with the urologist or gynecologist in complicated or obscure cases. He must be competent to meet any emergency and cope with any condition found in his field of operation. He needs courage as well as technical skill and surgical judgment, since extensive procedures must frequently be resorted to that try not only the tolerance of the patient but the fortitude and technical skill of the surgeon. He must have skill in plastic surgery to be able to repair defects incident to extensive removal of tissue.

Present-day surgery has been made remarkably safe for the patient. Of late we hear that the patient should be made safe for surgery. This latter statement carries quite an implication. Adequate preparation of the patient to make him "safe for surgery" is possibly the greatest forward movement that has been made in surgery in the past decade. To perform this task requires a knowledge of physiology and its various perversions and of adverse biochemical reactions thay may be taking place. One need mention only the correction of dehydration, anemia, disturbances of the acid-base balance, ion concentration, and the like. To be more specific, let us again consider the jaundiced patient. Our knowledge of the effect of vitamin K deficiency, absence of bile from the intestinal tract, and liver damage has enabled us to prepare such a patient so that

he may quite safely withstand a prolonged surgical procedure, one that formerly was associated with a high mortality rate. Similarly in the case of the patient with pyloric obstruction, who has retained little or no food for many days because of incessant vomiting, our knowledge of malnutrition, vitamin deficiency, disturbance of acid-base balance, dehydration, loss of chlorine ions, hypoproteinemia and anemia enables us again to prepare for an extensive surgical procedure.

The surgeon has need, also, for expert ability to distinguish pathologic changes. It is not always his privilege to have a pathologist by his side. Moreover, the pathologist, if present, cannot see the lesion as well as the surgeon nor can he feel it. The onus falls entirely upon the latter's shoulders, since he must recognize the specific type of disease present and its invasion or dissemination. Upon his ability to do this, his technical skill, and his competence to evaluate the capacity of the patient to tolerate the contemplated surgical procedure, rests the issue.

A word of caution should be inserted here for the benefit of both the surgeon and the pathologist. The surgeon is entitled to examine the tissue removed at operation, but he should not recklessly mutilate the specimen. He must be an able surgical pathologist and by carefully examining gross specimens he will increase his pathologic knowledge. The final detailed pathologic study must be made by the pathologist in his laboratory and he should be given every consideration and aid.

I have presented this rather sketchy survey of the operation of a tumor clinic in order to characterize, if possible, the role of the surgeon. His qualifications have been enumerated and his duties computed. Beyond this he must possess infinite patience, a disinclination for defeat and a broad tolerance to fit himself into an harmonious and smoothly functioning group.

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A Tumor Clinic for Patients of Moderate Means[1]

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Boston, Mass.

AT A MEETING OF the American College of Surgeons, held in Philadelphia in 1930, Dr. Robert B. Greenough recommended the establishment of tumor clinics in general hospitals, and enumerated the following advances in diagnosis and treatment to be expected from such a plan.

1. The work in cancer cases is placed in the hands of those members of the staff who are most interested in that subject.
2. Opportunity is given by consultation with representatives of the clinical, pathological, and radiotherapeutic departments for mutual instruction and increase in knowledge of the disease and its treatment.
3. A definite rational plan of treatment can be determined for each individual case after consultation; and the results can be checked and discussed by the group in the subsequent follow-up.
4. Concentration of hospital material permits greater experience and more productive work.
5. The standards of the hospital for efficient diagnosis and treatment of cancer are inevitably raised, and this educational effect extends beyond the hospital to medical students and to physicians in general practice in the immediate vicinity.
6. The additional expense to the hospital involved in the maintenance of the tumor clinic is nominal.

The rapid growth of the tumor clinic idea and the results obtained in these clinics during the past decade have fully justified Doctor Greenough's expectations.

There are certain basic principles which should not be overlooked in the establishment of a tumor clinic and which should perhaps be enumerated at this time.

1. The Clinic should be part of a general hospital, preferably a teaching hospital, equipped to do advanced surgical and radiological work.
2. The staff should be selected from the staff of the hospital and should consist of surgeons, physicians, radiologists, and pathologists. No one group should dominate the Clinic.
3. The work of the Clinic should be a consultation and follow-up service. Treatment, when required, should be carried out by the department of the hospital to which the patient is referred, or by his physician.

The following plan has been in operation at the Massachusetts General Hospital for many years and has proved satisfactory.

Administration: The Tumor Clinic Committee is composed of six members, representing the Departments of Surgery, Medicine, Radiology, and Pathology. They are appointed by, and are responsible to, the General Executive Committee. The Tumor Clinic Committee nominates its own chairman and secretary: the secretary may, or may not, be a member of the Committee.

The duties of the Tumor Clinic Committee are to formulate all policies, pass on all candidates for admission to the medical staff (the non-medical staff is part of the Department of Radiology), and such other functions of administration as may arise.

Medical Personnel: The medical personnel includes a senior and assistant surgeons, a senior and assistant physicians, a senior and assistant radiologists, and a

[1] From the Department of Radiology, Massachusetts General Hospital, Boston, Mass. Presented, as part of a Symposium on Tumor Clinics in General Hospitals, before the Radiological Society of North America, at the Twenty-eighth Annual Meeting, Chicago, Ill., Nov. 30–Dec. 4, 1942.

senior and assistant pathologists. The medical, surgical, and dental specialties are grouped under surgery or medicine. The head of each division will recommend candidates for staff appointments on his service to the Tumor Clinic Committee. All members of the Tumor Clinic must be members of the staff of the general hospital with which it is affiliated.

The Clinic: The Clinic is open daily from 9:30 A.M. to 1:00 P.M. Physicians representing medicine, surgery, and radiology are available throughout the week; physicians representing the subspecialties, one day a week for each specialty.

When treatment is recommended, whether surgical, medical, or radiological, the patient is transferred to the proper service, which is responsible for his care during the treatment period. When the treatment is completed the patient returns to the Tumor Clinic for follow-up.

Teaching: A staff conference is held once a week, at which interesting, controversial, or difficult cases are discussed.

Short postgraduate courses in cancer diagnosis and treatment are given for general practitioners.

Daily clinical teaching throughout the school year is available for medical students.

Research: The Follow-up Service offers an excellent opportunity for end-result studies. Close affiliation with the pathologic laboratories and with the laboratories for cancer research gives opportunity for fundamental investigation of the cancer problem.

. . . . .

The type of clinic which I have just described has in our opinion simplified to a considerable extent the cancer problem as it is related to patients in the low income group. It has not been applied to that large group of people who are of moderate means, or to the well-to-do, although it is true that better trained physicians are now available for all patients in the community and that the knowledge gained in these clinics is of benefit to all.

The well-to-do can usually afford the expense made necessary when adequate consultation is demanded, and we do not feel that this group has suffered from inadequate or improper care. The patient of moderate means, however, is often unable to carry the financial burden of a long and complicated illness, and, as so often happens with this group, the management of his case is not so good as it is in either the upper or the lower group. For several years we have felt the need of a Tumor Clinic for patients of moderate means.

On Jan. 1, 1942, the Collis P. Huntington Memorial Hospital, formerly conducted by Harvard University, closed its doors, and part of its activities were transferred to the Massachusetts General Hospital. The Huntington Hospital was established for the study and treatment of cancer and allied conditions. All classes of patients were accepted and a large group of patients of varying financial status were followed. Transfer of these patients to the Massachusetts General Hospital Tumor Clinic required some changes in our set-up; and it seemed to us that here was an opportunity to do what we had had in mind for a long time; namely, to establish a Tumor Clinic for patients of moderate means. Another thing which we thought would help the venture to succeed was the fact that the physicians composing our group had been working harmoniously together for many years and were therefore less likely to be disrupted by the introduction of a group composed of semi-private patients.

In setting up the clinic, the principles governing the established Tumor Clinic, which have just been enumerated, were followed as far as possible, and the new clinic was made a part of the older one. Only members of the staff of the Free Clinic were asked to serve in the Pay Clinic, and it is administered by the same Tumor Clinic Committee. The Free Clinic is held in the morning; the Pay Clinic in the afternoon. In this way we are able to use the same space and the same lay personnel, thus reducing costs.

The earnings from the Clinic, after operating costs have been deducted, are divided among the professional personnel on a basis of hours spent in the Clinic. When radiation treatment is advised, the patient is referred to the Department of Radiology. The fee for this service is collected by that department. Since all members of this department are on a full-time, salaried basis, and the amount set aside for salaries is to some extent dependent upon the earnings of the department, no difficulties develop regarding the division of fees.

When surgical treatment is advised, the patient is referred to the Surgical Department, and he may choose his surgeon. In practice the Clinic acts to some extent as the family doctor in helping the patient make an intelligent choice. Often the surgeon chosen is a member of the Tumor Clinic. This may lead to unpleasantness between the members of the surgical staff, but so far nothing of this nature has developed.

In the Tumor Clinic the charge to the patient is a consultation charge and may include fees for minor surgical operations, such as the taking of a biopsy, or other procedure necessary to establish a diagnosis. All charges for treatment are made by the department (or the physician) to which the patient is referred. This elimination of treatment from the Tumor Clinic is, in our opinion, of fundamental importance.

Since the Clinic was opened, on June 15, 1942, it has shown a satisfactory growth. During its first three months of life, 166 patients have been seen. Of these, 66 were new admissions and 100 follow-up visits. The charge per visit has not yet been definitely established, but as far as can be determined it need not be more than ten dollars for the first visit and five dollars for each subsequent visit.

It is, of course, too soon to draw any conclusions regarding the success of such a clinic, but at least a beginning has been made in a field which up to now has not been given the attention it deserves.

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Practical Aspects of Tumor Clinic Management[1]

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THE GUIDING principles for the establishment and management of tumor clinics in general hospitals have been outlined by the American College of Surgeons, and Dr. Bowman Crowell, whose efforts have been largely responsible for the widespread establishment of these clinics, has discussed their set-up in detail.

My own contribution to this question will be limited to a review of the actual management of a tumor clinic in a general hospital and the problems which we have encountered at various times in the Michael Reese Hospital. I shall, of course, not enlarge on any isolated instances or minor problems which may occur in the daily routine of such institutions, but rather concentrate on the major problems involved.

One of the major factors in the actual operation of a tumor clinic is the selection of those who are to serve as consultants on the staff. We have left it to the separate departments (Surgery, Gynecology, Dermatology, Ear, Nose, and Throat, Urology, etc.) to select their representatives on the Tumor Clinic Committee, but we have limited the eligibility of these men to some extent. The first requirement is that they must be of associate rank or higher, which means that they actually have had a thorough training in their own specialty. Second, the men to be selected must be known to have a special interest in the diagnosis and treatment of tumors in their own field. Third, they must agree to attend the group consultations in order to familiarize themselves with patients under observation and to follow up the course of their disease. The appointments of men serving as representatives of their respective departments are made for three years, in such a way that each year four members of different departments are replaced, in order to maintain a staff of men serving in the Tumor Clinic who have had some experience in its actual management.

These special conditions have been set up for good reasons. If members were selected in the same way as for other staff committees, there would be the danger of lack of interest of the appointee, and we actually have encountered such instances. In one case the man chosen by his department had to be replaced because he never attended any of the group consultations and declared that any decisions made by the Director of the Tumor Clinic would suit him perfectly. This, we felt, was not the type of co-operation we wanted. On the other hand, we have been gratified by the interest of most of the men serving as consultants for their respective departments. In several instances members who have served their three-year term have insisted on continuing for another term, because they found these group consultations of such great value to themselves that they wished to maintain their affiliation with the Tumor Clinic. In some departments—I refer especially to the gynecologists and the ear, nose, and throat specialists—there was actual rivalry between the members as to who should have the privilege of serving first on the Tumor Clinic staff, and I am told that the Gynecological Department has made up a sequence of prospective representatives for the next twelve years. I believe that this attitude reflects better than any description the interest of the physicians involved and the reputation that these group consultations enjoy among members of the hospital staff.

We had to face the problem of the time to be allotted to actual consultations for

[1] Presented, as part of a Symposium on Tumor Clinics in General Hospitals, before the Radiological Society of North America, at the Twenty-eighth Annual Meeting, Chicago, Ill., Nov. 30–Dec. 4, 1942.

the patients, and I feel today more than ever that this question is most important and is still not definitely solved. On the one hand, we had to arrange for the necessary examining and waiting rooms and the help of the nursing staff, social workers, and clerks; on the other hand, we had to take into consideration the time when all members of the group, numbering fourteen physicians, could be in attendance. Every physician as an individual was willing to spend whatever time was necessary in the Tumor Clinic, but it was impossible to arrange for a suitable time for everyone concerned. Besides, not every physician was interested in every branch of tumor diagnosis and therapy. The dermatologist certainly has different interests than the neurosurgeon, and in most instances the dentist or oral surgeon will not be interested in gynecological findings. We therefore decided to divide the patients into two different groups and arranged that tumors of interest to specialists having common interests be seen at the same time. For example, it is obvious that surgeons may be interested in seeing cancer of the skin or oral cavity. This arrangement had the distinct advantage that we could count on the interest of the men who attended each clinic, and in addition made it possible to work as a smaller group, which in turn facilitated the discussion of the actual cases. It did happen, however, that some representatives, especially the member from the Pediatrics Department, attended all sessions of both clinics. I still feel, however, that the solution of this problem is not entirely satisfactory and far from ideal. In some instances we cannot avoid having a given patient, especially in an emergency, referred to the clinic which meets at the earliest date although the man who would be most interested in the case, and with whom the course of therapy should be discussed, may not be present. It has, of course, always been possible to remedy these relatively minor problems.

In conducting the clinics we encountered cases which we wanted to discuss in greater detail with members of a special department in order to get the points of view of several experienced men. These included problems of principle and questions of policy rather than decisions in a particular case. In order to provide for such eventualities, we decided to have, in addition to the actual consultations, monthly conferences where the especially interesting cases which had come up in some one specialty might be presented. To these conferences we invited members of the respective departments, presenting on one occasion surgical cases to the surgical group, on another occasion gynecological cases to the gynecological group, ear, nose, and throat cases to a third group, etc. In the conferences, we discussed, in addition to diagnosis, therapy, and prognosis in the individual case, the current literature relative to the type of tumor under consideration and exchanged opinions as to the principles involved.

These conferences proved to be highly stimulating and profitable. One example may illustrate their tendency. In the course of several years we encountered a number of patients in whom supracervical hysterectomies were performed, and these patients, either following the operation or at a much later date, developed carcinomas in the stump of the cervix. It was our feeling that such occurrences could have been avoided, at least in some instances, if proper diagnostic measures had been taken before operation. While it is true that the individual gynecologist may see such a case only once in many years, we were able to present in one of these conferences six patients with similar findings. In a very thorough discussion between the Tumor Clinic group and the members of the Gynecological Department, the latter decided to change their policy and to make such preliminary diagnostic measures compulsory for patients operated upon in our hospital. It may be only a coincidence, but in the following two years we have not encountered a single case of carcinoma of the stump of the cervix in the clinic or in the hospital.

Probably one of the most important

questions as far as the management of a tumor clinic is concerned, and a rather difficult one for an initial decision, is the choice of the chairman of the group or the director of the clinic. It is a position requiring responsibility, experience, and ability in handling patients as well as colleagues, the latter usually being the more difficult task. We feel that group consultations are an excellent way to discuss matters, but there must be someone to make final decisions. Furthermore, it is important for the continuity of the work, and practically indispensable for the follow-up system, that the chairman of this group remain in office over a period of years. If I may say so, I believe that the choice of the chief of the clinic is the most important decision in determining the type of clinic the hospital will have. No tumor clinic will be better than its chief. The requirements for the appointment of such a chairman must be very high: he must be thoroughly familiar with the work and should preferably be a recognized authority in tumor diagnosis and therapy. Only then will he encounter relatively few difficulties. Furthermore, I believe that it is of great advantage for the director to work on full time in the hospital in some capacity. There are three logical possibilities for the choice of the chief of the clinic: he may be a pathologist, a surgeon, or a radiotherapist.

The full co-operation of a capable pathologist in the tumor clinic is, of course, indispensable. No definite diagnosis can be made without his positive help. But in my opinion a pathologist will not always be qualified to serve as chief of the clinic. The reasons are simple. We are dealing in the tumor clinic mainly with decisions based on clinical findings, and most pathologists do not have sufficient clinical experience to be able to make decisions even in purely diagnostic matters. We have cases on record, to quote examples again, where the pathologist found a tumor of benign nature, as, for example, lymphoid hyperplasia, but in which the clinician was able, from his experience, to diagnose the presence of malignant changes—lymphosarcoma or leukemia—even in the absence of positive blood findings. In some of these instances the diagnosis of malignant growth was verified pathologically many years after the patients were first seen, sometimes in postmortem examinations. The pathologist was, of course, entirely correct in stating that these lesions at the time of microscopic examination were not malignant in character, but the clinical signs of malignancy were already present and a decision had to be made with regard to the therapy to be instituted. Similar experiences could be cited in dealing with papillomas of the urinary bladder or larynx, with mixed tumors of the parotid gland, and others.

As far as the therapy of tumors is concerned, the pathologist is even more handicapped. We have encountered apparently radioresistant tumors, where the pathologist advised definitely against radiation therapy, and based on the microscopic findings his judgment was absolutely right. Such lesions, however, could be controlled with radiation therapy for many years and some have been completely cured with radiotherapy alone. In view of such experiences, it does not seem advisable to have a pathologist in charge of a tumor clinic when the decisions to be made are mainly clinical. This leaves us with the possibility of appointing either a surgeon or a radiotherapist. I frankly admit that I am prejudiced in favor of the radiotherapist, and am sold on our solution of this problem, which keeps a radiotherapist in charge of the Tumor Clinic.

There is, however, one condition which I think is essential in the choice of the radiotherapist, and that is the separation of the x-ray diagnostic department from the department of radiation therapy. I believe that it usually will be impossible in a large hospital (and only a large hospital will in general be able to staff and carry on a tumor clinic) to conduct, as chairman of the tumor clinic, both the roentgen diagnostic service and the radiation therapy satisfactorily. The work of the radio-

therapist consists to a large degree (in our department, between 75 and 85 per cent) of tumor therapy, and the man faced with such an amount of tumor work will be forced to study these lesions and be familiar with all types and forms of tumors. The general surgeon, on the other hand, operates only on a very limited class of tumor cases and would have to leave a great part of tumor surgery to specialists in gynecology, otorhinolaryngology, oral surgery, neurosurgery, etc. In addition, a great number of tumor patients who are operated upon will receive radiotherapy at one time or another and most of the inoperable tumor cases will probably be submitted to radiation therapy. Furthermore, most radiotherapists have had some surgical experience either during their internship or during their training and are able to evaluate the indications for surgery to a better extent than the surgeon can do for radiotherapy, since surgeons, with few exceptions, are still inclined to consider the radiotherapist more of a technician than a doctor. I wish to emphasize, however, that no attempt is made to play up one specialty over the other or to underestimate the work of either.

There are, of course, surgeons with special interest in tumor work who are qualified in radiotherapy, also, and have the qualities that the best tumor specialists require. I believe, however, that such surgeons probably are encountered more rarely than are qualified radiotherapists, and I would therefore recommend, in general, that a radiotherapist be in charge of the tumor clinic.

A very important problem which may be encountered is the question: Who makes decisions if there is a difference of opinion between the members of the group? Fortunately, we have not encountered within the group any major differences about the management of special cases which could not be solved in a relatively easy manner. We have had, however, differences of opinion between the group on one side and the physician who referred the patient for consultation on the other. In this connection I must explain one rule which we have established at our hospital, and which I believe facilitates our work to a great extent. That is the rule that every patient admitted to the wards of the hospital, or to the out-patient department, who has a tumor or is suspected of having a tumor, must be referred to the Tumor Clinic before any therapy can be instituted. This rule guarantees that all tumor cases are seen by the group and that no decision concerning the proper handling of the patient is made before the patient has had the benefit of the group consultation. Now it has happened, in a case of carcinoma of the breast, for example, that the surgeon who first saw the patient suggested immediate admission to the hospital for a radical mastectomy. If the group decides that such a patient should have the benefit of preoperative radiation and the referring surgeon does not wish to revise his recommendation, the final decision is made by the representative of the department concerned in the Tumor Clinic, in this case by a surgeon experienced in general tumor diagnosis and therapy. So far, we have always been able to settle matters in this way and have not encountered any particular difficulties from the remaining members of the staff.

These are some of the major problems encountered in the practical operation of our Tumor Clinic in the past five years. There are many other problems which I have not discussed, not because they are negligible, but because they are easier to settle, as, for example, the follow-up system, problems arising in and connected with the social service department, and others. I have not attempted to offer more than a brief outline of our policies and some solutions of the problems encountered. The actual management of the Tumor Clinic has been a source of great satisfaction to most of us concerned, and the fine spirit of co-operation in the group has proved to be a thoroughly valuable experience.

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DISCUSSION OF SYMPOSIUM ON TUMOR CLINICS IN GENERAL HOSPITALS

(Papers by Bowman Crowell, M.D., Louis C. Kress, M.D., John A. Wolfer, M.D., George W. Holmes, M.D., and Erich Uhlmann, M.D.)

Ludvig Hektoen, M.D. (Chicago, Ill.): I have the impression that this has been a constructive and wholesome discussion.

The National Advisory Cancer Council, to which reference has been made, has been much interested in the development of cancer clinics and it has recommended consistently for several years support of the work of the American College of Surgeons in surveying the country for the establishment of new clinics and for control of those clinics already established.

The National Advisory Cancer Council has been concerned with other aspects of cancer as it relates to clinical work, also. There was the problem, for example, of distributing $200,000 worth of government radium by loan to cancer clinics in various parts of the country. That was accomplished some time ago. There is no more fresh radium available. The only radium that may be available at this time is radium that has been returned after being loaned.

The Council has also been interested in the provision of the Cancer Act that makes it possible to support training in cancer diagnosis and treatment by means of stipends for young physicians who wish to devote themselves more or less exclusively to cancer work. A considerable number—fifty or so trainees—have had the advantage of this provision. The plan so far followed has been in the main a basic course of training in pathology, in radiology and, for the most part, training in surgery as related to cancer. Just now there are no applications to speak of for this kind of training because, obviously, the younger men are going into military service. Curiously enough, there have turned up interesting instances in which young physicians with minor physical defects have applied for training and there is room for such applicants now, qualified physicians who for some reason or other are not suitable for military service.

I do not wish to enter into details, but as a pathologist I want to make one comment on the diagnosis of radioresistant cancer. In many cases, I believe it is safe to say, the pathologist has no business to make any such diagnosis. It cannot be determined from the morphologic structure of a cancer whether or not it is resistant to radiation. I have particularly in mind squamous carcinoma. There the point is not the structure of the tumor but its extent. Early squamous carcinomas are susceptible to cure by proper irradiation.

Finally, it seems clear that in order to make progress in a large sense in the control of cancer, cancer clinics must be established all over the country, as pointed out by Doctor Crowell, and this program can be carried out only by co-operation on the basis of a common understanding among medical, social, and governmental agencies.

Edward H. Skinner, M.D. (Kansas City, Mo.): This symposium brings together essayists who represent nearly all the auspices under which tumor clinics operate, with the exception of private enterprise. Doctor Crowell represents an organization that has fostered the surgical supervision of such clinics. Doctor Kress presents the state medicine angle and it is interesting to find him blithely advocating clinics without pay to the physicians. Doctor Holmes describes a plan which compromises private enterprise in an endeavor to meet an alleged social demand. Doctor Uhlmann discusses the problem of a tumor clinic which emphasizes radiation therapy within a large city institution.

It is quite natural for me, being in private practice and not in the least disposed to regimentation of individuals, science, or opportunity, to argue in favor of private enterprise as contrasted to the wave of tumor clinics that are being imposed by enthusiastic boards, organizations, and even the state and national governments upon the bending backs of a willing profession. It is amazing how inadequate and insignificant the individual becomes to institutionally minded physicians and administrators. They seem to lack confidence in the native honesty of an individual and prefer to establish a board that shall pass upon patients and problems. This technic also dissipates and dilutes responsibility.

I would like to introduce in the record at this time quotations and illustrations pertinent to tumor clinics from a British source. I refer to the article upon *Radiotherapy and the Cancer Act* by Ralston Paterson, Director of the Radium Institute of Manchester, published in the *British Journal of Radiology* for October 1942, as part of a Symposium on Problems of Post-War Reconstruction in Radiology, by five leaders in the medical profession of Great Britain. It is interesting to observe that, while some of our national societies, including this one, may be contemplating denying themselves their annual sessions for 1943, British radiologists, in the midst of a war that has been brought home to everyone in England, are continuing to hold their yearly meetings.

In his paper Ralston Paterson, who, as we all realize, is one of those responsible for the Paterson-Parker tables, says of the British Cancer Act of 1939: "There are two important items of the Cancer Act which will require our consideration: (1) The creation of cancer diagnostic services. (2) The provision of adequate and efficient treatment both by radiotherapy and surgery." He then presents a table [reproduced here] in which he shows the estimated number of new cancer cases per annum per million of population and their probable allocation for treatment within the limits of present day achievement. These cases are divided into three groups: curable, treatable, and hopeless.

CANCER CLINICS: NUMBER OF CASES PER MILLION FOR DIAGNOSIS (BASED ON 150 PER CENT OF NUMBERS TREATED)

Group I "Spot Diagnosis" Lesions visible or palpable		Group II Radiological (Diagnosis depending *mainly* on radiodiagnostic examination)		Group III Technical (Diagnosis depending *mainly* on special or instrumental examination)	
Breast	312	Stomach	177	Pharynx, larynx	59
Mouth	116	Colon	125	Bladder	99
Skin	63	Œsophagus	45	Uterus (1/2 of)	67
Uterus (2/3 of)	133	Lung	27	Ovary	44
Genitalia	39	(Bone)	45?	(Brain)	45?
Rectum	100				
	763		419		314

Number for Examination per Million per Annum
(In round figures)

Spot diagnosis	750
Radiological	400
Technical	300

One paragraph I wish to quote as containing much in support of Doctor Uhlmann's remarks:

"It is impossible to have any separation between radium therapy and x-ray therapy and both must be in the same hands—those of the radiotherapist. Trained therapists of to-day have been recruited about equally from the ranks of surgeons *via* an interest in radium and from the ranks of radiologists, *via* deep therapy."

Again, when it comes to the matter of cancer diagnostic services, these paragraphs:

"The key-note of the ideal treatment unit is a high degree of actual centralisation and the difficulties of distance should not be made too much of—they can be surmounted. When we come to *the problem of reaching the cancer case at an early stage*, the opposite rule holds and the key-note must be decentralisation in the geographic sense—but not as regards personnel. Multiple clinics must be established. For treatment, the association of a hospital with the idea of cancer cannot be avoided but it is important that these outside clinics are neither called nor even become known as cancer clinics. The only way to avoid this is to incorporate them in the existing out-patient services. As medicine is at present organised, this usually means that they will be held at voluntary hospitals.....

"This is not a task which calls for a team of specialists collected away from their home town at considerable expense. *It can be done with 100 per cent efficiency by one man provided only that man has experience at this job and is doing a lot of it.* In a completely centralised cancer service it is a matter of complete unimportance whether he be a surgeon, radiotherapist, or physician. In the more decentralised expedient organization described, by means of which radiotherapy is worked in collaboration with a local hospital surgical service, it would be best that this man be a radiotherapist, as his duty will entail additionally the responsibility of deciding, in collaboration with the local surgeon, the choice between surgery and radiotherapy."

One last quotation I wish to give you:

"These diagnostic clinics must be so widely distributed that no patient faces difficulties or hardships in getting there. It is desirable that the clinics be held at least fortnightly in each place."

A table entitled "Cancer Clinics" in which the cancer cases are divided into three groups, is self-explanatory.

This is the first time that I have seen such a survey of cancer per unit of population. Furthermore, the quotations above carry potent arguments in favor of individual responsibility and capacity even when the experiment in cancer diagnosis and therapy is projected by the state.

Clarence F. Ball, M.D. (Rutland, Vt.): Most of you have been considering the conduct of cancer clinics in large centers. They should also be held in the country.

In 1939 the Vermont State Medical Society appointed a Cancer Committee, which made efforts, through the legislature, to get an Enabling Act. An Act was established and a Commission was appointed with an appropriation of $10,000 annually for cancer work. Without going into great detail, I may say that our problem was that of the care of the white-collar class. We have no really wealthy people in the state. In fact, the entire population is only that of a fair-sized town, as most of you know towns.

The Commission, by the Enabling Act, was limited to the payment of one-half of the *therapy* care in cases of cancer. It could, however, pay all *diagnostic* charges. In the two cancer clinics that were established, the Commission pays all of the diagnostic expenses in the hospital where the diagnostic work is being done. When therapy is required, the Commission then pays for the latter half of the treatment, providing the first half has been cared for from some other source. This source was at first the local town. We operated for a year or two on this basis, but found that there were many of the white-collar class who did not come to the clinic for

ESTIMATED NUMBER OF NEW CANCER CASES PER ANNUM PER 1,000,000 POPULATION: PROBABLE ALLOCATION UNDER ADEQUATE ORGANISATION BUT WITHIN THE LIMITS OF PRESENT-DAY ACHIEVEMENT IN DIAGNOSIS AND TREATMENT

(From Ralston Paterson: Radiotherapy and the Cancer Act. Brit. J. Radiol. 15: 297–301, October, 1942)

Site (Registrar-General's Terminology)	Present Situation		No. per Million for Treatment Under Improved Organisation twice Sholto Mackenzie figure or 100%	Probable Allocation for Treatment							
				Surgery				Radio-Therapy			
	No. of Deaths per Million Population (plus 20% approx.)	Percentage Treated Now (after Sholto Mackenzie Public Health Report No. 89)		Radical Treatment	Palliative Treatment	Surgical Treatment on Cases Primarily Radiotherapeutic	No. for Operative In-Patient Investigation but Found Untreatable	Radical Treatment	Palliative Treatment	Radiotherapy on Cases Primarily Surgical	Untreated (or purely Placebo Palliation)
"Curable" cancers											
(a) Mainly surgical											
Breast	208	68	208	108	0	10	0	50	50	70	0
(b) Mainly radiotherapeutic											
Mouth	77	71	77	5	0	20	0	45	27	1	0
Uterus	133	56	133	12	0	0	0	103	18	2	0
Skin (excluding basal cell) and lip	42	64	42	20	0	2	0	20	2	2	0
Genitalia	26	50(?)	26	8	0	0	0	8	10	1	0
	486	....	486	153	0	32	0	226	107	76	0
Treatable" cancers											
(a) Mainly surgical											
Stomach	382	5	38	20	18	0	80	0	0	0	264
Colon	268	8	43	20	23	0	40	0	0	0	185
Rectum	168	20	67	30	30	0	0	0	7	10	101
Bladder and prostate	105	22	46	13	7	10	20	13	13	5	39
Ovary	50	29	29	16	0	0	0	0	13	5	21
(b) Mainly radiotherapeutic											
Pharynx and larynx	50	39	39	5	0	0	0	18	16	0	11
(c) Other sites (figures are estimates only)	118	42(?)	99	24	25	0	0	25	25	0	19
	1,141	....	361	128	103	10	140	56	74	20	640
Hopeless cancers											
(a) Worth palliative treatment											
Œsophagus	72	21	30	0	15	0	0	0	15	10	42
Lung and mediastinum	125	7	18	0	0	0	0	0	18	0	107
(b) Seldom worth treating											
Other abdominal (liver, pancreas, gall bladder, etc.)	176	2	7	4	3	0	30	0	0	0	139
	373	....	55	4	18	0	30	0	33	10	288
Total	2,000	....	902	285	121	42	170	282	214	106	928
						618			602		

fear of being listed as paupers, not knowing that the Vermont Act provides that persons receiving funds for cancer care shall not be so listed. This knowledge has increased clinic attendance materially.

After about two years we found that we were not reaching all that we wished to reach and, following a conference with the Governor, the Commission was permitted to accept the first half of the treatment fee from other sources. That is, it might be paid by the patient himself or by friends. As a result, we have now succeeded in really doing what we wished to do. Now anyone not able to finance his own cancer care can be aided by the State, provided he is assisted by his local welfare department, his own efforts, or by friends. In the two latter cases an investigation is made by a welfare worker and the situation must be approved before assistance becomes effective.

Bowman Crowell, M.D. (closing): I wish to congratulate those who made up this program and to congratulate the Society on having provided such a program and on the selection of those who have participated in it—with one exception, of course.

This is the best symposium on the subject of cancer clinics that it has been my privilege to attend, and I have attended practically all that have been held during the past ten years.

I am in thorough accord with all that has been said by the various speakers this morning with possibly one exception—Doctor Uhlmann's championship of the radiotherapist as the absolutely logical head of the cancer clinic. The choice of the executive officer of the Tumor Clinic depends upon the interest and the amount of time and the conversancy with the subject of the group constituting the clinic. Select the man with interest and ability. He may be the radiotherapist, he may be the surgeon, or he may be the pathologist.

It is expedient in different places to choose the man who can best correlate the group of men. There is something aside from medical knowledge that is necessary in the executive officer of a clinic—ability to bring out the best of the group that constitutes the clinic. I feel that Doctor Uhlmann's argument to the effect that the radiotherapist is more likely to know what surgery can do than the surgeon to know about what radiotherapy can do does not enter into consideration. That is forgetting the spirit of the clinic, which is a co-operative effort, not dominated by the executive officer or anyone else. As far as scientific conclusions are concerned, I believe that should be the objective.

Lymphosarcoma: A Statistical Study and Evaluation of Treatment[1]

WILLIAM E. HOWES, M.D., and BELLA LEVIN, M.D.
Brooklyn, N. Y.

PATIENTS SUFFERING with lymphosarcoma are found as a small minority in the medical wards of every general hospital. Lymphosarcoma is highly malignant and, while the individual tumor may be affected by radiation, the course of the disease is usually progressive. Lymphosarcoma may arise in any organ which has a basic reticulum structure, *i. e.* lymphoid tissue, spleen, liver, or bone marrow. Its onset is insidious. A latent period may exist before the primary, more localized tumor is transformed into a generalized condition. The earliest spread is by way of the lymphatics, from one group of lymph nodes to another, though the exact mechanism of this extension is not known. Later, metastatic growths appear in distant organs.

Kundrat (1) is widely quoted as having been the first to describe lymphosarcoma. He wrote of it as arising most frequently in groups of nodes rather than in a single node. It may also arise in lymph aggregates in the intestine, tonsil, or pharynx. By analyzing its mode of spread, he differentiated it from the leukemias and carcinomas with widespread metastases.

ETIOLOGY

So little is known of the causative factors in lymphosarcoma that Ewing (2) aptly states: "An attempt to review the clinical data regarding lymphosarcoma is like looking into a fog at sea. . . ." The following three statements summarize our fragmentary knowledge: (1) A much higher percentage of deaths occur from lymphosarcoma in the Orient than in North America. (2) It may follow the injection of certain carcinogenic substances. (3) The frequency with which it is linked with chronic infection is significant.

CLASSIFICATION

As with any complex subject where so little is known of specific causes, differences of opinion exist as to classification. Thus, two schools of thought have arisen. According to one, neoplastic diseases of lymphatic origin arise from a common cell source. This parent cell may deviate in its development to produce any one of a number of pathological entities. Symmers (3) writes:

> "There is a series of diseases of the lymphoid system, commencing with giant follicular lymphadenopathy, each member of which is conceived in hyperplasia of lymph follicles. This series includes giant follicular lymphadenopathy, Hodgkin's disease, certain forms of lymphoid leucemia, lymphosarcoma, the immature large cell sarcoma of lymph nodes described in this paper and probably others. All of them except of course giant follicular lymphadenopathy appear in the end as divergent histologic changes, although initiated, it would seem, by the same cause."

These related conditions have been grouped together under the heading of lymphoblastoma by Minot and Isaacs (4). Metamorphosis of one entity into another has been repeatedly presented in the literature: as, mycosis fungoides into Hodgkin's disease (Wile and Stiles, 5); lymphatic leukemia and mycosis fungoides into lymphosarcoma (Fraser, 6; Keim, 7); lymphosarcoma into leukemia (Warthin, 8 and 9).

A second group of investigators takes the attitude that each of the malignant lymphomata is a separate and distinct disease entity arising from some one component element in the lymphatic system. Sugarbaker and Craver (10) say:

> " . . . the lumping together of thirteen or more different terms into a general category of lympho-

[1] Presented before the Radiological Society of North America, at the Twenty-eighth Annual Meeting, Chicago, Ill., Nov. 30–Dec. 4, 1942.

Fig. 1. J. I. (Chart 2759): Lymphoma arising in the fornix of an upper eyelid. Surgical excision resulted in cure.

blastoma seems an unfortunate defeatist step, hardly serving to make progress in understanding the natural history of what are probably different processes."

PATHOLOGY

Ewing (2) differentiated three varieties of lymphosarcoma and associated each pathological pattern with a rather typical and distinctive clinical course. His classification is as follows:

Lymphadenoma
- Multiple giant follicular lymphadenoma—Brill's disease
- Gastro-intestinal pseudoleukemia

Lymphocytoma
- Systemic pseudoleukemia[2]
- Lymphocytic leukemia[2]
- Malignant disseminating lymphocytoma
- Plasmocytoma[2]
- Solitary lymphoma

Reticulum-cell lymphosarcoma
- Large round-cell lymphosarcoma affecting many regions and organs

[2] Not included in this report.

Multiple giant follicular lymphadenopathy, first described by Brill, Baehr, and Rosenthal (11), is a disease associated with enlargement of many lymph nodes throughout the body. The microscopic picture is that of an increase in number and size of the germinal centers. The progress of the neoplasm is usually slow; life expectancy varies from five to ten years. The individual lesions respond readily to small doses of radiation (Rubenfeld, 12). Sugarbaker and Craver (10) feel that this condition is "an early setting for lymphosarcoma," while Symmers states that giant follicular lymphadenopathy may undergo "transformation" into lymphosarcoma, leukemia, or Hodgkin's disease. No one case in this series is classified under this heading, though 3 cases may have had their initial phase as giant follicular lymphadenopathy, since previous biopsies had shown giant follicles. Two of these patients have died of generalized lymphocytoma.

Gastro-intestinal pseudoleukemia is described by Ewing (2) as "a peculiar systemic disease affecting at times the whole intestinal tract; producing myriads of small lymphomas in the mucosa from mouth to anus, without ulceration, and extending to many chains of lymph nodes and spleen; running a steadily progressive and rather active course with some fever, anemia, diarrhea, emaciation, peritonitis, and death within a few years or few months." The histology is characteristic, in that the lymph follicle is not destroyed but is made up of normal to large lymphocytes with few reticulum cells. No case in this series could be listed under this heading.

Malignant disseminating lymphocytoma represents a most malignant type of neoplasia. A Memorial Hospital Report (10) did not list one five-year survival in this category, and Jenkinson, Kinzer, and Brown (13) consider this subgroup as potentially more malignant than the large-cell or reticulum-cell type. Twenty-nine cases are listed as of the lymphocytoma type in this series, and 10 of the patients

are living. Microscopically the follicular structure is entirely destroyed, the cells are small, round, and lacking in cytoplasm; they are closely packed together, with but little supporting tissue. They have all the morphological characteristics of the lymph cells which are normally grouped around the germinal center of the lymph follicle.

Solitary lymphoma, on the other hand, is usually a benign tumor which can occur in any lymph aggregate. Here the normal anatomical structure of the lymph follicle is maintained. Two such cases are recorded as being admitted to the clinic during the time interval of this study. One lymphoma arose at the upper fornix of the conjunctiva, forming a fleshy tumor between the orbit and the upper lid (Fig. 1). From an objective standpoint there was no difference between this lesion and a similar conjunctival growth in a patient suffering from a widespread lymphosarcoma of the skin and viscera (Fig. 2). In the second case of solitary lymphoma the tumor arose from the mucous surface of the rectum as a polypoid type of growth. Neither of these lymphomas recurred after excision. Neither case is included in the statistical summary, as these lesions are not considered malignant.

Reticulum-cell lymphosarcoma is the large-cell type. Here the cells are relatively much larger than in the lymphocytic type of sarcoma. They are round or irregularly rectangular in shape. The nuclei are proportionately large and deeply staining. These cells have a certain similarity to the cells making up the germinal center of each lymph follicle. Fifteen cases of the reticulum-cell type are listed in our series, with but 3 patients living. Clinically there is a tendency to localization of the primary focus (in mucous membrane, skin, spleen, bone marrow, or lymph nodes) for a longer or shorter period. Ewing (2) says that this type of lymphosarcoma is prone to appear in the healthy, robust, overnourished subject, in contrast to other types of lymphosarcoma. Craver and Copeland (14) and Parker and Jackson (15) state that lymphosarcoma arising in bone is always of the reticulum-cell type.

Fig. 2. C. B. (Chart 4977): Lymphocytoma near inner canthus, lower lid, not distinguishable from a simple non-malignant lymphadenoma. This patient had extensive lymphomatous nodules throughout her skin and numerous tumors in the viscera.

STATISTICAL REVIEW OF SERIES REPORTED

Between October 1936 and December 1940, 47 cases of proved lymphosarcoma were admitted to the Brooklyn Cancer Institute.[3] This report is not limited to patients treated in the Institute but includes those treated in other hospitals and later referred for observation or further treatment. There has been 100 per cent follow-up in this series, with autopsy study in 8 of the 34 deaths.

Except for the history of duration, all records are dated from the day of admission to the Brooklyn Cancer Institute. The cases represent 1.2 per cent of all

[3] The Brooklyn Cancer Institute was moved to its present location in October 1936. Prior to that date case records were included with those of a large general hospital.

admissions during the period covered. Twenty-nine of the patients were males and 18 females. The youngest was a baby girl of fourteen weeks and the oldest a woman of seventy-five years. The largest number of cases in any one decade was 12, in the fourth. The group includes 5 children ten years old or younger, but the average age adds up to thirty-nine years. Our experience that 4 out of 5 children ten years of age or younger have survived from two to six years is not in accord with other reports as to the fulminating character of the disease in the young. The inclusion of all cases admitted through December 1940 allows a follow-up interval of two to six years. An attempt has been made to correlate the treatment with the progress of the disease.

TABLE I: CLASSIFICATION OF CASES ACCORDING TO PATHOLOGY

	Cases	Living
Lymphadenoma		
Multiple giant follicular lymphadenoma	0	..
Gastro-intestinal pseudoleukemia	0	..
Lymphocytoma		
Malignant disseminating lymphocytoma	29	10
Solitary lymphoma	2*	..
Reticulum-cell lymphosarcoma	15	3
Cases not classified as to type	3	0

* Not listed in end-results as cases are considered non-malignant.

Table II lists all cases according to the year of admission with the end-result and the average monthly survival.

TABLE II: END-RESULTS

Year of Admission	No. of Cases	Living		Dead	
		No.	Average Duration after Admission (months)	No.	Survival after Admission (months)
1936	4	2	72	2	28
1937	11	3	59	8	5
1938	10	4	50	6	10
1939	9	1	40	8	4
1940	13	3	28	10	7
TOTAL	47	13		34	

Further analysis of the clinical material is attempted by subdividing the cases according to the most probable site of origin (Table III).

TABLE III: MOST PROBABLE SITE OF ORIGIN

Neck	17
Groin, abdomen, and retroperitoneum	14
Tonsil, antrum, nasopharynx	4
Mediastinum	4
Axilla	3
Bone	3
Rectum	2

The Neck: Lymphosarcoma arising in the cervical lymphatics without a known primary lesion in the mucous membrane of the mouth or nasopharynx is of the small-cell type in a large percentage of the cases under consideration. It is in this location that simultaneous involvement of a chain of nodes may most easily be observed. The involved nodes tend to enlarge slowly and the spread is apt to be to the other superficial lymph nodes, as the parotid, submaxillary, axillary, and even the inguinal nodes, before metastasis to the deeper nodes in the mediastinum and retroperitoneal chains occurs. As a result, these patients are prone to survive for longer periods than is customary in lymphosarcoma arising elsewhere. Le-Count (16), in 1899, reported a case with a survival of fifteen years. Five of our group are living to date and 12 have died. The following case history is illustrative of such a long-standing condition:

C. C. (Chart 3052), a 44-year-old white woman, was admitted to the Brooklyn Cancer Institute in October 1936 with a ten-month history of painless swelling on the left side of her neck. Biopsy in another institute revealed lymphosarcoma of the small-cell type.

On admission the patient had an "egg-sized" globular mass beneath the muscle in the upper left cervical chain. This node disappeared after irradiation. About one year later, nodes were discovered in the left submaxillary triangle and left axilla. These areas were treated. In 1939 nodes were palpable beneath the sternocleidomastoid muscle on either side of the neck. These were cross-fired through lateral cervical ports. In 1940 a mass was felt in the left supraclavicular fossa below the previous site of involvement. In July 1942 an enlarged node below the right mastoid process was irradiated. The patient was recently readmitted to the Cancer Institute, and radon seeds were inserted into the

C. C. (CHART 3052): SUMMARY OF THERAPY

Interval	Area	Ports	Size	Tumor Dose
11/9/36 to 11/23/36	Left neck	Anterior and posterior	6 × 8 cm.	3,000 r
11/27/37 to 12/8/37	Left submaxillary	Anterior	3 cm. circle	1,600 r
12/20/37 to 12/29/37	Left axilla	Anterior and posterior	8 × 10 cm.	1,500 r
8/14/39 to 8/23/39	Right and left neck	Lateral	6 × 8 cm.	1,550 r
1/15/40 to 2/5/40	Left supraclavicular	Anterior and posterior	8 × 10 cm.	3,000 r
7/27/42 to 8/18/42	Right upper cervical	Anterior and posterior	6 × 8 cm.	3,800 r
10/23/42 to 11/22/42	Right cervical	Interstitial radon	3 cm. diam.	5,000 gamma r

slowly re-enlarging cervical nodes on the right. She has been followed for six years, always with evidence of disease. Her present condition is excellent.

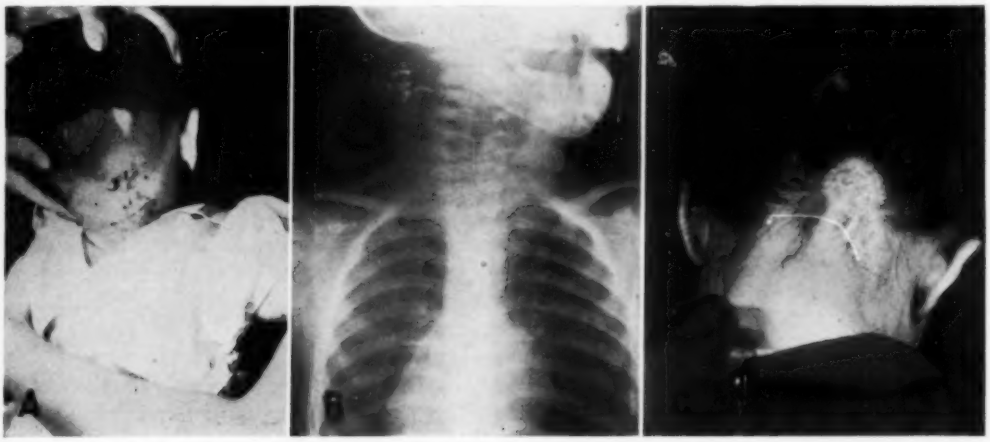

Fig. 3. H. V. (Chart 1601): Reticulum-cell sarcoma of neck. A. Recent scar following original dissection. B. Roentgenogram showing location of radon seeds. C. End-result: extensive scarring.

Interestingly enough, 2 cases in this primary neck group are classified as reticulum-cell sarcoma; both patients are living to date. One, a 75-year-old negress, is alive and well nine years since radiation therapy. Her case has been previously reported in detail (17). The second case may be summarized as follows:

H. V. (Chart 1601), a female infant aged 11 months, was admitted to the clinic in July 1938 (Fig. 3A.). A two-month history of a rapidly growing tumor on the back of the neck was obtained from the child's mother. This had been recently excised in another institution and a microscopic diagnosis had been made of lymphosarcoma, large-cell type. No mass was palpable at the time of admission. Within two months, however, a tumor "the size of a plum" could be felt deep beneath the scar.

Six 2-mg. needles, active length 23 mm., were inserted in stepladder formation, approximately 0.5 cm. apart. They were left *in situ* for fifty-one hours for a dose of 612 mg. hr., an estimated 1,500 gamma r to the tumor. The radium reaction following this treatment resulted in a central slough, which healed within two months.

Recurrence was again observed in the same location one year later, in December 1939. At that time the tumor was estimated as a sphere 3 cm. in diameter. Twenty gold radon seeds of 1 millicurie each were inserted in a geometrical pattern (Fig. 3B) in and about the recurrence for a total dose of 2,660 mc. hr., an estimated 7,000 gamma r. A rather severe radiation reaction ensued, healing within three months, leaving a pale, slightly puckered scar (Fig. 3C). There has been no evidence of recurrent tumor in three years. The follow-up interval is over four years.

Groin, Abdomen and Retroperitoneum: Cases where the history suggests primary involvement of inguinal, intra-abdominal, and retroperitoneal lymph nodes have been grouped together. When the inguinal nodes are involved, there is usually some deep-seated lesion either within the ab-

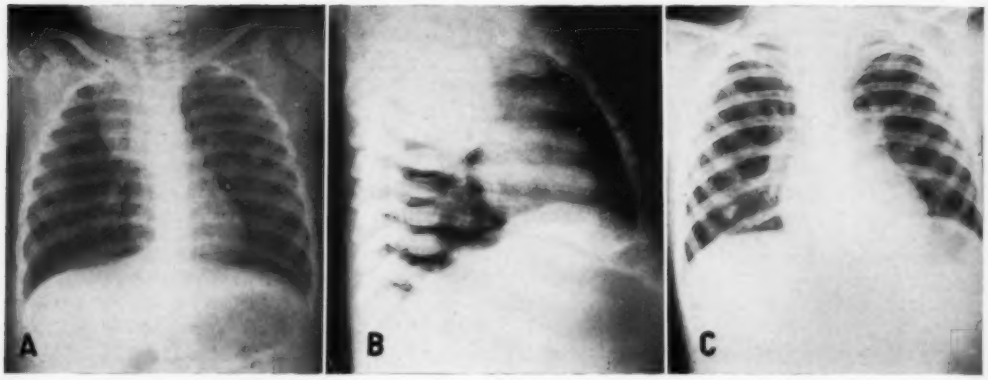

Fig. 4. R. T. (Chart 2973): Mediastinal lymphosarcoma. A. Postero-anterior roentgenogram. B. Right lateral roentgenogram. C. Post-irradiation roentgenogram, two-year interval.

domen or along the course of the iliac and retroperitoneal nodes. Two patients in this group of 14 have survived. All of the others, except one, died within five months of admission to the hospital. Apparently when the disease is widespread within the abdomen or retroperitoneum the possibility of alleviation is minimal. The surviving patients are two young people whose lesions were located in the distal third of the ileum. It is well known that where the lymphosarcoma is limited to a segment of gut and its mesentery, it is amenable to surgery (Charache, 18). A case report is given to illustrate such a survival.

F. P. (Chart 6661), male child, aged 7 years, was referred to the Brooklyn Cancer Institute for radiation therapy following a laparotomy. On examination before operation an abdominal mass was found in the mid-line below the umbilicus. This mass could be shifted to different sectors of the abdomen. X-ray studies showed dilatation and distortion of a segment of small bowel without evidence of obstruction.

A laparotomy was performed in October 1933. A tumor nearly 9 cm. in diameter was found involving a segment of lower ileum. Enlarged nodes were present in the mesentery. A resection with a side-to-side anastomosis was done. The pathological examination revealed small-cell lymphosarcoma.

The child was referred to the Cancer Institute, where he received x-ray therapy, but on calculation the radiant energy delivered to the tumor was found to be negligible. In our records this case is listed as a six-year survival, though actually nine years have passed since intestinal resection.

Tonsil, Antrum and Nasopharynx: The discovery of lymphepithelioma by Regaud (19) and Schmincke (20) has revolutionized our concepts as to the site of origin of most tonsillar and nasopharyngeal new growths. Both from a clinical and cytological standpoint lymphosarcoma and lymphepithelioma closely simulate each other, their spread is similar, and their response to irradiation nearly identical. On reviewing the records (Howes and Bernstein, 21), it is apparent that the pathologist of the Cancer Institute (Bolker) found the vast majority of these tumors arising from the epithelial components rather than the lymphatic elements in the oral and pharyngeal mucosa. To illustrate the difficulties of accurate differentiation, the following case report is submitted:

J. R. (Chart 3385), a white male, 21 years of age, was referred to the Brooklyn Cancer Institute from another institution after biopsy of a right cervical lymph node. Two pathologists agreed that the section was that of lymphosarcoma, small-cell type. A tumor dose of 7,000 r was delivered within twelve days. The young man was followed for five years before a small mass was noted in his nasopharynx, which on biopsy was diagnosed as anaplastic carcinoma, again by two pathologists. On weighing the facts of this record, it was decided that this case must be discarded because of the discovery of a small primary epithelial carcinoma in the nasopharynx, despite a five-year interval.

Only 2 cases of proved lymphosarcoma of the tonsil could be found on search of

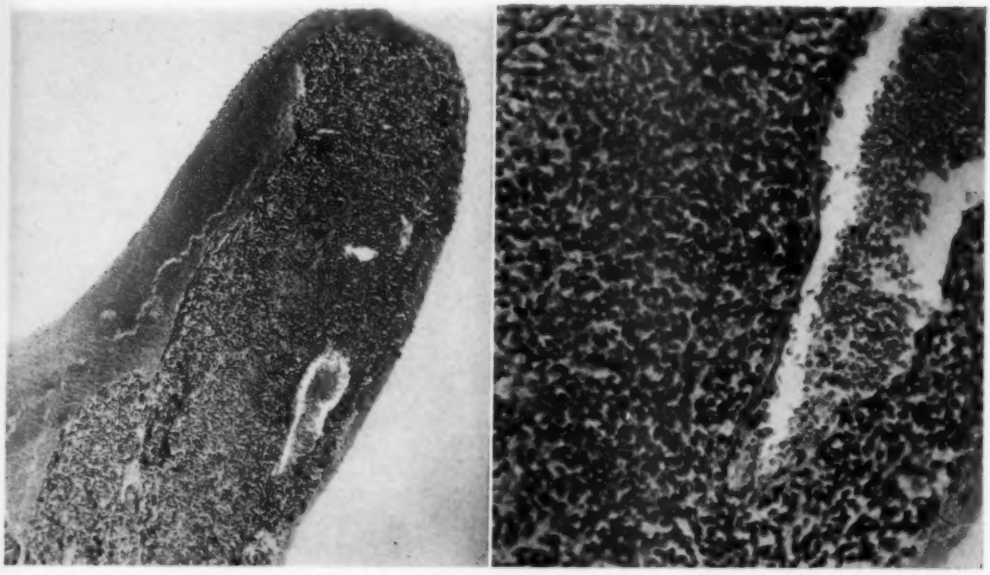

Fig. 5. S. S. (Chart 1759): Tissue obtained by split needle puncture biopsy of mediastinal tumor: lymphosarcoma, small-cell type.

our records; one patient is now alive over four years without recurrence. He received 7,000 r to his tumor within twenty-one days.

An accessory nasal sinus is an unusual location for a primary focus. The tumor in this case never appeared to spread except by direct extension, but in spite of its localized character, radiation therapy had little effect. The case is summarized:

S. M. (Chart 461), a 58-year-old white woman, was admitted to the Brooklyn Cancer Institute from another institution following a radical antrotomy. The pathological report was lymphosarcoma, type not determined (later biopsies were unsatisfactory because of a superimposed infection). On admission there was ulceration with a cauliflower mass protruding through and over the right cheek. X-ray therapy was not effective. The patient died nine months later with symptoms of meningitis.

Mediastinum: To make an exact diagnosis of mediastinal tumors is difficult because of their location. The split-sheath type of needle recommended by Tenopyr and Silverman (22) is ideal for obtaining a small specimen from such deep-seated lesions. This bit of tissue may be immersed in wax and sectioned, and the cell type and cell relationship may be studied. Figure 5 represents such a specimen (under both low- and high-power magnification) obtained from patient S. S. (Chart 1749).

Three of the four lesions first noted in the mediastinum were in children twelve years of age or under. The relationship of these mediastinal primaries to the thymus is immediately suggested (Wiglesworth, 23). In the two younger children, the tumors were solid globular masses in the posterior mediastinum. As both these patients are living, the exact primary organoid site of the tumors must rest partly on speculation. The case histories are summarized:

R. T. (Chart 2973), a female infant one year of age, was transferred to the Brooklyn Cancer Institute in February 1940, a mediastinal mass having been discovered in another institution, during treatment for an acute upper respiratory infection.

On examination the infant showed moderate undernourishment. She had increased adenoid tissue and enlarged tonsils. X-ray studies of the chest (Fig. 4, A and B) demonstrated a homogeneous shadow occupying the inner posterior upper quarter of the right lung field. This mass had a rounded, clear-cut, slightly wavy outline. Biopsy, by punc-

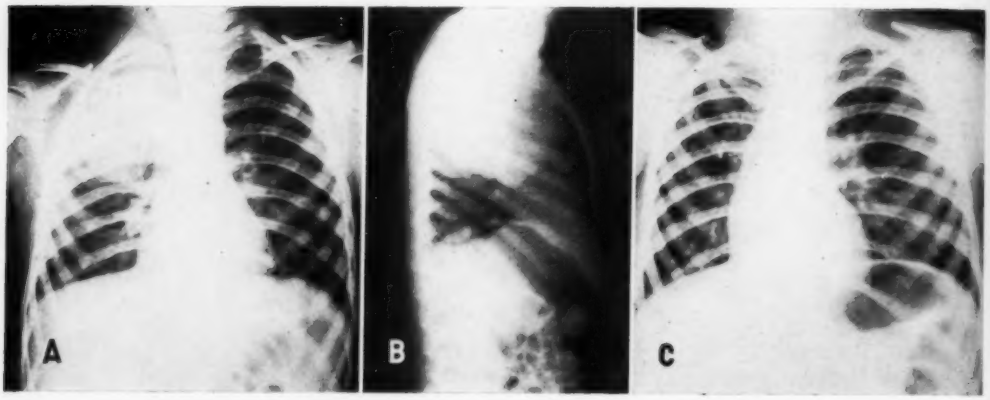

Fig. 6. S. S. (Chart 1749): Mediastinal lymphosarcoma. A. Posterior-anterior roentgenogram. B. Right lateral roentgenogram. C. Post-irradiation roentgenogram (three and a half years interval), showing fibrotic changes, upper right.

Fig. 7. S. S. (Chart 1749): Lymphosarcoma metastases in calvarium. A. Pre-irradiation. B. Post-irradiation.

ture with a split needle, led to a diagnosis of lymphosarcoma, small-cell type.

The upper right thorax was cross-fired anteriorly and posteriorly, through ports 6 × 8 cm., 1,000 r in air being delivered to each skin area, with a calculated tumor dose of 1,500 r at 6 cm. depth, within thirty days. The growth shrank rapidly. At the present time there is no x-ray or clinical evidence of any residual tumor (Fig. 4 C) The patient's weight has been followed only since June, and in this six-month interval she has gained 12 1/2 pounds. She has survived two and a half years.

S. S. (Chart 1749), a 3-year-old white boy, a well developed, healthy appearing child, was admitted to the Brooklyn Cancer Institute in June 1939 with the history of a persistent "dry" cough of two weeks' duration. His face was slightly asymmetrical in that there was an almost imperceptible exophthalmos on the right. The right pupil was somewhat larger than the left; both pupils responded to light and accommodation. There was no apparent weakness or lag of either eyelid. The superficial veins were dilated over the right side of the face, chin, and anterior thorax; the thoracic cage appeared moderately larger on the right than the left. There was dullness on percussion on the right upper side, with loss of breath sounds. No bruit or abnormal heart sound was obtained.

Roentgenograms showed the upper three-quarters of the right thoracic cavity filled with a dense, homogeneous globular mass (Fig 6, A and B). The upper half of the shadow filled the entire depth of the thorax, whereas the lower half was situated

Fig. 8. T. G. (Chart 3622): Mediastinal lymphosarcoma. This is the one patient of the mediastinal group over twelve years of age. He responded favorably to radiation at first but died after about two years. The illustration shows, from left to right, venous obstruction as demonstrated by an infra-red photograph; tumor protruding through chest wall; post-irradiation appearance.

centrally. The right half of the diaphragm was proportionately depressed. Tissue obtained with a split needle was reported on microscopic study as lymphosarcoma, small-cell type (Fig. 5).

The lesion was cross-fired through an anterior and posterior port, 6 × 8 cm., an estimated tumor dose of 4,900 r at 5.5 cm. depth being delivered within twenty-four days.

The cough disappeared almost immediately. Follow-up x-ray films demonstrated a gradual but continuous decrease in the size of the tumor. By February 1940, after an interval of eight months, no mass could be visualized. Recent films demonstrate a shift of the upper mediastinal contents to the right, with veiling and fibrotic strands extending out into the periphery as from radiation fibrosis (Fig. 6C). The patient is, however, symptom-free.

One month after completion of therapy to the chest, a diarrhea developed which was not relieved by diet or medication. A barium enema study was inconclusive. On the theory that this diarrhea may have been caused by pressure exerted by enlarged mesenteric nodes, x-ray therapy was ordered. Both the abdomen and back were divided into four areas, each approximately 7 × 10 cm., and a dose of 50 r in air was delivered to two areas in rotation every second to fifth day. After 200 r in air had been delivered to each of the eight skin portals, therapy was discontinued. The patient had long since ceased having loose stools.

In December 1939, six months after the child's admission to the clinic, the mother stated that he was less energetic and complained of occasional headaches. On passing the hand over the scalp there was a distinct lumpy feel to the calvarium. Skull x-rays disclosed numerous rarefying metastases ranging from "matchhead to cherry size" (Fig. 7).

Further roentgen therapy was instituted. Lateral ports 8 × 10 cm. were chosen, 200 r in air being delivered to each side daily for a total of 2,000 r in air, an estimated dose to the lesions in the squamae of 3,300 r. Epilation occurred ten days after completion of therapy, but the hair was restored within six months, this secondary growth of hair being heavier than the original. To date there are areas which have never entirely filled in with squamous and diploic bone. No masses are palpable, however, on the scalp. The child is mentally alert and does not complain of headache. He has gained 35 pounds in three years. He has survived three and a half years.

Axilla: Three patients first noticed swelling in the axillary region. Enlargement of nodes in this region is apt to be observed early in the course of the disease. The axilla is easily accessible to surgery or irradiation and, as a possible corollary, 2 of these 3 patients are living. One illustrative case history is presented:

A. B. (Chart 902), a white male 25 years of age, was admitted to the Brooklyn Cancer Institute in December 1937 because of a painless swelling under his left arm. The tumor had grown to the size of a large orange in four months. There were no other complaints.

On physical examination the only abnormality noted was a smooth globular mass low in the left axilla, measuring 8 cm. in diameter (Fig. 9).

The surgeon stated that he was able to remove the tumor "in toto, without cutting into any of the mass itself." The pathologist's diagnosis was lymphosarcoma, small-cell type. Two weeks after

Fig. 9. A. B. (Chart 902): Lymphosarcoma limited to axilla. Excision was followed by x-ray therapy. There has been no recurrence in five years.

this dissection the left axilla was cross-fired through anterior and posterior axillary ports, 10 × 15 cm., a tumor dose of 2,850 r being delivered within twelve days. The patient has shown no evidence of disease during a five-year follow-up interval.

Bone: In 3 cases, or approximately 1 in 15, the first symptoms were referable to bone, namely, pain and deep swelling. In two patients the process involved multiple bones in one extremity, while the third had extensive involvement of the ilium and sacrum, with a large tumor extending into the soft parts of the lower back. None of the biopsies was taken directly from the bone. In each instance biopsy disclosed lymphosarcoma, small-cell type. This discrepancy from the expected findings of a reticulum-cell sarcoma is not explained. Even though these bone lesions individually respond to radiation therapy, "with calcium redeposition and bone regeneration" (Howes and Schenck, 24), all of these patients died within one year of admission.

Rectum: Lymphosarcoma may involve any portion of the gastro-intestinal tract. The most common sites of origin are the stomach and lower ileum. The disease is rarely found in the rectum. Bensaude, Cain, and Horowitz (25) write that only 12 cases are reported in the literature before 1929. Cutler (26) lists a number of cases published since that date. Lymphosarcoma may remain localized to the rectum just as to other parts of the body before metastasizing. That our one surviving patient had such a localized process is attested by an analysis of her case report:

P. G. (Chart 709), a white female 19 years old, was referred to the clinic in February 1938 following removal of a rectal polyp. The microscopic section was that of a lymphosarcoma, small-cell type. Both the pathologist and surgeon stated that the polyp had been widely excised. Sigmoidoscopy and roentgen examination with a barium enema failed to disclose the presence of other polypi. Because of these facts and because of the patient's youth, it was decided that she should receive no irradiation unless some other lesion were discovered. To date, nearly five years later, there has been no evidence of recurrence.

TREATMENT

Table IV gives a more detailed record of the survivals with a summation of the type of therapy in each instance.

Treatment was directed to but a single location in 9 of the 13 patients who have survived. Of these 9 patients, none has shown the slightest evidence of recurrence of tumor in two to six years. It is therefore concluded that these were examples of localized lymphosarcoma and that the neoplasm was destroyed before dissemination. In only one instance has death occurred where the disease remained limited to one locality, namely, the antrum.

When localized, lymphosarcoma may be eradicated by surgery or radiation. With generalization, however, the possibility of cure becomes negligible. Here, radiation is the only logical modality of treatment. According to Leucutia (27), radiation raises life expectancy in lymphosarcoma from two and a half to three and a half years, with an expectant cure of 10 to 15 per cent of all cases.

Eight autopsies were performed in this series. The results of these dissections bring out the fact that there is a spread to the mediastinal and retroperitoneal nodes in a large percentage of patients dying from lymphosarcoma. Six out of 8 patients had mediastinal extension and 6 out of 7 had retroperitoneal involvement. (One postmortem examination was limited to the thorax.) Involvement of cervical, axillary, and inguinal lymph nodes in no way excludes spread to the deeper lymphatic chains. Treatment should therefore include the more superficial node-bearing regions of known involvement and also the deeply hidden nodes in the mediastinal, periaortic, and retroperitoneal zones (Desjardins, 28).

The radiosensitivity of lymphosarcoma is well known. Response to irradiation is almost immediate and not delayed, as in epithelial new growths (Desjardins, 29; Reynolds and Leucutia, 30).

Intensive consecutive irradiation of large lymphosarcomatous growths often results in rapid shrinkage of the mass; despite

Fig. 10. M. G. (Chart 1992): Lymphosarcoma involving multiple bones of one extremity, pre- and post-irradiation roentgenograms.

TABLE IV: SURVIVALS, WITH TOTAL DURATION AND TYPE OF THERAPY

Year	Case and Chart No.	Sex	Location	Type†	History in Months		Follow-Up after Admission in Months		Total Months	Treatment
1936	*FP-6661	M	Ileum	L	32	+	72	=	104	Surgery
	CC-3052	F	Neck	L	10	+	72	=	82	Biopsy removal + x-radiation
1937	*EP-4013	F	Neck	R	36	+	60	=	96	X-radiation
	*VV-16	F	Neck	L	18	+	60	=	78	Biopsy removal + x-radiation
	*AB-586	M	Axilla	L	4	+	57	=	61	Surgery + x-radiation
1938	*EM-1252	M	Ileum	R	21	+	48	=	69	Surgery
	*PG-709	F	Rectal	L	6	+	56	=	62	Surgery
	*LB-1644	M	Tonsil	L	2	+	49	=	51	Gamma + x-radiation
	*HV-1601A	F	Neck	R	0	+	47	=	47	Incomplete surgery‡ + gamma radiation
1939	SS-1749	M	Mediastinum	L	1	+	40	=	41	X-radiation
1940	MS-2410	F	Axilla	L	7	+	30	=	37	Incomplete surgery‡ + x-radiation
	*RT-2973	F	Mediastinum	L	2	+	30	=	32	X-radiation
	CL-2799	F	Neck	L	4	+	24	=	28	X-radiation

* No evidence of residual disease. † L = Lymphocytoma. R = Reticulum-cell lymphosarcoma.
‡ Case is listed as incomplete surgery when there was immediate recurrence at the operative site.

this, the clinical course continues progressively downhill. There is either a coincident rapid growth of tumor in other parts or, more frequently, the patient appears to develop a so-called "toxic state." The practice of the radiologists at the Brooklyn Cancer Institute, therefore, is never to give an area of 100 sq. cm., or over, more than 100 r in air at the initial treatment. The individual dose is built up to 200 r in air to one area and, as a maximum, to 200 r in air to two areas if the patient tolerates the larger dose satisfactorily. The usual treatment interval is twenty-four hours. This spacing may be lengthened to forty-eight or seventy-two hours, depending on clinical response.

Tumor response depends upon the amount of radiant energy absorbed (Meyer, 31), and as the absorption is proportional to the depth dose, a ray quality is chosen where the first d/2 in water will reach the tumor level. A ray quality whose half-value layer is 1.8 mm. copper is therefore selected in the treatment of all deeply seated tumors, as in the mediastinum and retroperitoneum. This may be reduced to a half-value layer of 0.9 mm. copper when the more superficially located nodes in the neck, supraclavicular, and axillary regions are being treated. A constant target skin distance of 50 cm. is maintained (see Howes and Bernstein, 32).

All tumors are cross-fired. The size of the area should exceed the dimensions of the palpable mass. Ports in most instances should include whole groups or chains of lymphatics, as the entire side of the neck. In this location anterior and posterior ports, often 8 × 10 cm., are chosen. In treating the mediastinal and retroperitoneal regions the areas should be of sufficient size to reach all nodes and the portals so planned that there shall be no gaps. The mediastinum is treated through four ports, often 7 × 15 cm. The retroperitoneal and periaortic nodes are cross-fired through posterior ports. When masses can be palpated in the upper quadrants, x-ray therapy to the upper anterior abdomen is indicated. Direct irradiation of the upper abdomen usually produces serious radiation sickness. A tumor dose of 3,000 r is delivered within three weeks when possible.

Inguinal nodes are frequently associated with involvement of the iliac and other lymph nodes within the pelvis. If the involvement is unilateral, four areas 10 × 15 cm. are chosen, two anterior and two posterior, and again a tumor dose of 3,000 r is delivered into the region of the deep iliac structures. If there is suspicion of bilateral inguinal or pelvic involvement,

six ports are chosen, three anterior and three posterior. Two areas are treated daily. Here the treatment period will extend from one month to six weeks. To withhold irradiation from the pelvis in women before the menopause hardly seems warranted unless the lesion is localized and has been widely excised.

Four of 36 patients with generalized lymphosarcoma have survived from two to six years. In a further effort to correlate treatment with results, the case histories of these 4 patients are summarized, the radiation therapy in each instance analyzed, and the prognosis estimated:

The case of C. C. (Chart 3052) has been summarized above (page 568). She received 8 cycles of radiation therapy to neoplastic nodes in various parts of the body. The tumor dose varied from 1,500 to 5,000 r. This patient has never been clinically free of disease. Careful analysis suggests that radiation therapy has acted as a deterrent to the progress of the condition. At the time she was treated no systematic plan of therapy was employed. She is ambulatory and in good general condition, and represents a six-year survival. Prognosis in this case is poor.

The case of S. S. (Chart 1749) has also been summarized (page 572). The tumor dose of 4,900 r was apparently adequate in destroying the mediastinal tumor. The child may never have had mesenteric nodes. The metastases in the cranium were obvious on the x-ray film. A tumor dose of 3,300 r was delivered to the skull within eleven days. Except for persistent residual areas of decalcification in the cranial bones, there is now no evidence of disease. This is a three and a half years survival. Prognosis is good.

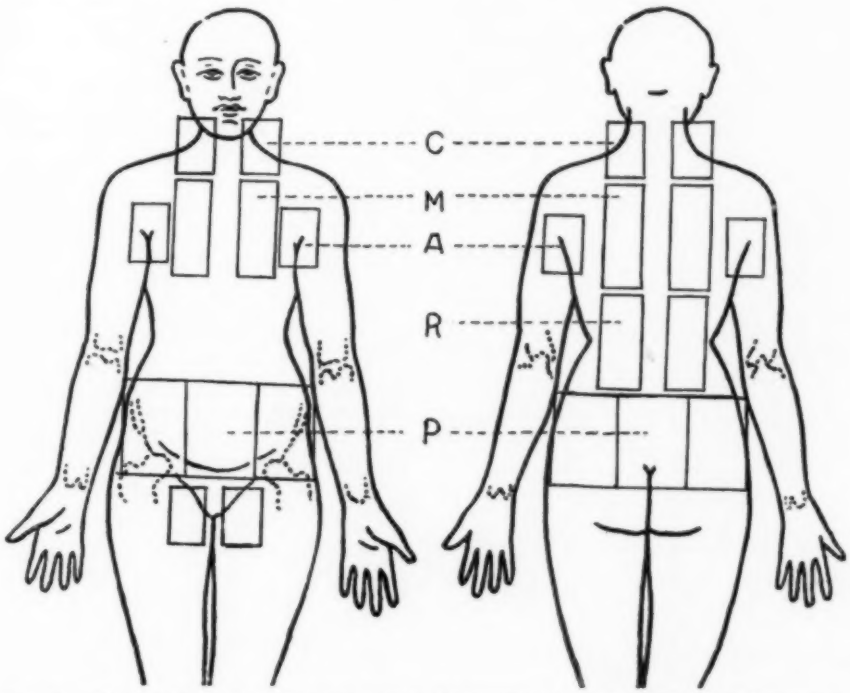

Fig. 11. Theoretical location of x-ray portals for treatment of widespread lymphosarcoma.

M. S. (Chart 2410), a 39-year-old white female, was referred from another institution following removal of a mass from the right axilla. The pathologist reported "lymphosarcoma, small-cell type." When the patient was seen at the Brooklyn Cancer Institute there was evidence of a deep mass beneath the scar. The axilla was cross-fired and a tumor dose of 1,400 r was delivered within eleven days. A year and a half later an additional dose of 1,000 r was delivered into the same axilla for recurrent tumor. The left pelvis has been irradiated for inguinal and iliac masses. The pelvic irradiation produced an amenorrhea. In September 1942 the tumor extended into the left breast and 2,000 r, tumor dose, were delivered into the breast within

twenty-two days. Here the original quantity of radiation to the axilla was small and may have been a factor in the recurrence and later dissemination of the disease. The patient is ambulatory, and her general condition is excellent. She has survived two and a half years, but her ultimate prognosis is extremely poor.

C. L. (Chart 2799), a white female, aged 43, was first admitted to the Cancer Clinic in September 1940. Her history dated back four months, when she had first noticed swelling on the right side of her neck. When she was first seen, several nodes in the right anterior cervical chain were enlarged, there were walnut-sized nodes in each axilla, and several large nodes in the left inguinal region. The liver was palpable 1 1/2 inches below the costal border. The patient was ambulatory and able to carry on her usual activities. She received a large amount of x-ray therapy between October 1940 and April 1942, as follows:

	Tumor dose, r	Interval, days
Right and left axilla	2,000	17
Right and left cervical	1,000	12
Right and left inguinal	2,000	9
Right epitrochlear gland	3,000	20
Right and left cervical	300	5
Right and left mastoid	300	23
Right and left cervical	800	6
Inner aspect right upper arm	1,000	9

She has recently been referred to another institution, where she is still ambulatory but slowly losing ground. The radiation therapy in this case appears to have had but local effect and has not changed the slow but continuous progress of the disease. Again the tumor dose was less than our estimated minimal "lymphosarcinogenic lethal" dose of 3,000 r delivered within three weeks. No broad plan of therapy was set up. Irradiation was outlined only as evidence of spread was discovered. This is a two-year survival; prognosis is poor.

SUMMATION OF RESULTS OBTAINED

Thirteen of 47 patients with proved lymphosarcoma admitted to the Brooklyn Cancer Institute are living two to six years; 9 have no evidence of residual tumor and appear to have had their disease eradicated by surgery, irradiation, or both.

Four of 36 patients with disseminated lymphosarcoma have survived two to six years. Here, irradiation apparently had some effect in temporizing the course of the more generalized disease.

CONCLUSION

When lymphosarcoma has metastasized, treatment should include not only the obvious areas of superficial involvement but should also be directed to the mediastinum and retroperitoneal regions. While lymphosarcoma is most radiosensitive, a sterilizing dose should be administered. In the authors' opinion this approximates 3,000 r to the tumor within three weeks.

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DISCUSSION

T. Leucutia, M.D. (Detroit, Mich.): There is no doubt that Doctor Howes' paper is a valuable contribution on the problem of treatment of lymphosarcoma. As the authors state, the classification of the various cellular proliferative processes arising in connection with the lymph nodes is complicated and most difficult. For the same reason, the evaluation of the therapeutic results obtained by different methods and especially by different technics of irradiation must remain for the time being inconclusive.

It is to the credit of Doctors Howes and Levin that they have obtained such a large percentage of good results in the early localized forms of both the lymphycytoma and the reticulum-cell sarcoma. The procedures employed are amply discussed and analyzed in the text.

In the more generalized forms, the response to irradiation was less favorable, only 4 of 36 patients surviving from two to six years. Perhaps I may be permitted to make one or two remarks concerning this.

As is stated in the text, the authors prefer to use the fractionated, protracted method of roentgen therapy with cautiously chosen initial doses, which are then gradually stepped-up until a total tumor dose of 3,000 r (measured in air) has been given over a period of three weeks. Obviously, if the lymphosarcoma is generalized and many tumor-bearing areas have to be exposed with such a technic, there can be no end to the radiation cycles. I wonder if the end-results could not be improved by administering larger doses at one time—of course, within the limit of tolerance of the patient.

There is another point which I would like to raise, and that is the question of biopsy. The authors, by following Ewing's pathologic classification, refer to multiple giant follicular lymphadenopathy as perhaps an early setting for lymphosarcoma and state that 3 of their cases in which previous biopsies showed giant follicles were eventually transformed into lymphocytoma, with 2 deaths from generalization of the disease.

During the past ten years at Harper Hospital we have made it a rule, whenever a strong clinical suspicion of lymphocytoma exists and the biopsy reveals giant follicular hyperplasia of the lymph nodes, associated not infrequently with sinus catarrh of the germ centers, to take a second, third, and fourth biopsy from different enlarged lymph node areas until the malignant neoplasia is confirmed.

It seems that in the presence of lymphocytoma or reticulum-cell sarcoma in one location of the lymphatic system, not infrequently the lymph nodes of other areas become involved in a reactive process which histologically may manifest itself as the above described lesions. I would greatly appreciate Dr. Howes' opinion on this point.

A. Nettleship, M.D. (National Cancer Institute): I think we were all rather surprised by the chronicity of these cases. There are two concepts concerning lymphocytoma which pathologists have become rather fond of in recent years. One of these is that the disease begins in all probability as a primary localized tumor; the other is that it may be a long time before frank leukemia is manifest.

Unfortunately our knowledge concerning the group of lymphomata, of which lymphosarcoma is one entity, arose first through the knowledge of leukemia. That is, the first descriptions came from cases in which a generalized leukemia was manifest, so that our first idea concerning the local lymphoma was that it was primarily a generalized disease.

The group of cases which you saw today, similar to the cases which we see in experimental animals, points rather clearly to the idea that lymphoma arises—whether cytoma or reticulum-cell, etc.—

from one localized group of nodes or in one region of the body. This would point to a very sensible approach to the rationale of treating one area.

Another point is that in each case the disease will form a distinct pattern, and this is clearly brought out in large groups of experimental animals, where we see the disease in a high percentage of individuals. Each one has its own particular pattern.

The leukemic phase is always a late occurrence, so that when you see these cases clinically with an isolated nodule, there may be no blood change. On the other hand, the study of the blood is very important to indicate exactly how far the disease has progressed in the body, for once it has escaped from the original site, you may be quite certain that you will find it localized in other areas. In this respect, the total count in the blood stream is not so important as the differential count.

We have been very much struck by the fact that the entity known as giant follicular lymphoblastoma may terminate in a number of ways—not necessarily as a reticulum-cell lymphosarcoma but as a frank lymphatic leukemia or some other lymphoma.

Wm. E. Howes, M.D. (closing): My closing discussion will be brief. I would like to make one little correction, and that is to state that all the dosage calculations are to the tumor, Doctor Leucutia, and that, of course, includes back-scatter. The skin dose will vary with the depth of the tumor. I do think that the suggestion of building up the intensities even higher than I have done may be a good one. In the paper as written we do bring out the experiences which I have had, and I think possibly others have had, of giving some of these patients a large initial dose and seeing the tumor disappear before one's eyes, and also seeing the patient disappear equally rapidly. That has made me rather hesitant to increase the daily dose.

On the other hand, a series of treatments in which the patient is treated for two- or three-week intervals over two or three months in a year, and that during the course of three or four years, means a great deal of therapy, a great deal of supervision, and a great deal of expense to a private patient. We are in a city hospital where the expense doesn't have to be considered so much.

There was one other point that Doctor Leucutia made, as to giant follicular lymphadenopathy and its transformation into lymphosarcoma. I feel, in accordance with Doctor Symmers, and, I think, Doctor Craver, that giant follicular lymphadenopathy is a serious manifestation and if not itself malignant must be considered a premanifestation of a malignant condition in that it is very apt to be transformed into lymphosarcoma or, of course, into Hodgkins' disease. I have at present a patient, a young married woman, who offers just that problem, and I hope I will have the opportunity of following her case and seeing what happens.

With regard to leukemia, I advisedly left that group of cases out of this particular discussion because it made too big a problem to include in one paper. In all of these cases blood counts have, of course, been made, and in none were there any leukemic manifestations. Otherwise, they were deleted from the list. I will say, however, that the children had sternal marrow punctures, none of which was normal. I was unable, however, to decide exactly what they did show and, on consideration that their peripheral blood picture was normal, they were included.

Lesions of the Inconstant Sesamoids of the Foot[1]

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IN PREVIOUS publications (1, 2) the frequency of occurrence of the inconstant sesamoids beneath the metatarsal heads of the lesser toes has been discussed in detail with an extensive review of the literature. In this paper a few examples of changes of the inconstant sesamoids are presented, in order to demonstrate the possibility that these small, and ofttimes overlooked, ossicles may on occasion produce severe symptoms and even disability.

Fig. 1. Case 1: C. H. Dorsoplantar view of both feet (left foot taken with adhesive strapping). Note the large oblong sesamoid over the tibial side of the right second metatarsal head. The corresponding left second tibial sesamoid is divided transversely into two equal fragments. Note also the presence of two sesamoids beneath each fifth metatarsal head and on the tibial side of each fourth metatarsal head. The inconstant sesamoids are indicated by arrows.

CASE 1: *Fracture of the Inconstant Medial (Tibial) Sesamoid of the Left Second Toe.* C. H., female, 33 years old, was first seen at the Out-Patient Department of the Hospital for Joint Diseases on Aug. 27, 1929, complaining of pain over the ball of the left foot and difficulty in walking. On June 4, 1929, about two and one-half months prior to admission, while wearing shoes having high heels and thin soles, the patient stepped on a small, sharp pebble, which landed exactly beneath the left metatarsal region. The next day the left forefoot became swollen and painful. Thereafter the patient spent six weeks in bed. Pain was felt only on attempting to walk. No blue or black discoloration was observed. At the end of July 1929, the patient again attempted to walk, but the pain and swelling of the left forefoot increased.

The House Surgeon at the Hospital for Joint Diseases made the diagnosis of left anterior metatarsalgia, and padding was applied. Roentgenograms of both feet were taken and were reported negative. On Aug. 29, 1929, the patient was examined by the writer, who made the following notation: "Both feet are well formed. All motions are free and painless. Good pulsation of both feet

[1] From the Hospital for Joint Diseases (Service of Dr. Leo Mayer) and the New York Polyclinic Hospital and Medical School (Service of Dr. J. J. Nutt), New York, N. Y. Accepted for publication in December 1942.

Fig. 2. Case 1: C. H. Longitudinal section of sesamoid bone (low power). Note the two fragments separated by fibrous connective tissue with areas of calcification (arrow). The general picture is that of a fracture with fibrous union only.

arteries is palpable. There is a diffuse swelling around the dorsal aspect of the left second metatarsal head and also over the second toe. Considerable tenderness is elicited over the region of the second metatarsal phalangeal joint, but this is mostly localized over the medial plantar aspect of the metatarsal head. Roentgenograms (Fig. 1) show sesamoids over the medial aspect of the second, fourth, and fifth metatarsal heads on both feet. The sesamoid of the right second toe is oblong, ovoid shaped; the left seems to be broken in two parts. Impression: Possible fracture of the sesamoid bone beneath the left second metatarsal head."

Conservative treatment by means of padding was unsuccessfully tried for about two more weeks. The patient, therefore, was admitted to the hospital on Sept. 15, 1929, and was operated upon on the following day.

Under general anesthesia a 5-cm. longitudinal incision was made along the medial plantar aspect of the left second metatarsal head. The sesamoid was removed *in toto*, together with the medial (tibial) plantar part of the joint capsule, in which it was firmly embedded. The patient made an uneventful postoperative recovery. The wound healed by primary union, and she was discharged on the fifth postoperative day. At that time the local tenderness over the second metatarsal phalangeal region had completely disappeared.

On gross examination, the specimen was described by Dr. Henry Jaffe, the hospital pathologist, as consisting of "part of the joint capsule and tendon, which contains a sesamoid bone measuring 1 × 0.25 × 0.25 cm. The sesamoid bone is in two pieces, entirely embedded within tendinous tissue. A whitish, tendon-like tissue separates these two pieces, which are of about equal size."

Microscopically (Fig. 2), the two fragments of the sesamoid bone were seen to be separated by a connective-tissue layer with areas of calcification. The fragments were for the most part made up of calcified cartilage in the process of endochondral ossification.

Dr. Jaffe's final diagnosis of "fracture of the sesamoid bone with fibrous healing and calcification of the fibrous connective tissue" concurred with the clinical diagnosis.

On her last visit on May 29, 1930, eight months after the operation, the patient reported that her left foot had remained completely free of symptoms.

Comment: It can reasonably be assumed that in this particular case we have been dealing with a fracture of the inconstant left second tibial sesamoid, because (1) an undivided sesamoid of the same size was found on the right side; (2) the onset of the disability occurred immediately after local trauma; (3) the x-ray findings and pathological findings were indicative of a fracture. A congenital division of the left second tibial sesamoid, although improbable, could, of course, be definitely excluded only if there were available roentgenograms made prior to the injury showing normal sesamoids on both sides.

CASES 2–4: *Congenital Bipartite Sesamoids.* The cases of G. S., M. R., and A. B., as shown in the roentgenograms (Figs. 3, 4, and 5), should be considered as instances of congenital bipartite inconstant tibial sesamoids. In none of these cases at the time of examination were there any symptoms localized over the inconstant sesamoids. The division of the sesamoid was accidentally discovered on roentgenograms taken for some other reason.

In the case of A. B. (Fig. 5), although no history of injury could be obtained, there was a possibility of trauma, as evidenced by fracture of the right fifth toe and post-traumatic deformity of the nail phalanx of the left big toe.

Comment: It is of interest that the inconstant sesamoids of the human foot are

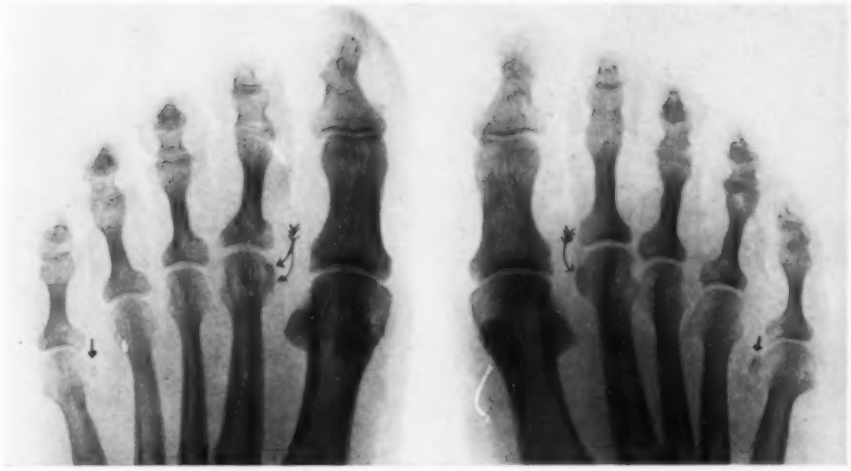


Fig. 3. Case 2: G. S., female, 42 years old. Note the presence of oblong right second tibial sesamoid (arrow). On the left side the second tibial sesamoid is bipartite (double arrow). Small arrows show the bilaterally present fifth tibial sesamoid.

Fig. 4. Case 3: M. R., female, 22 years old. Note the presence of oblong left second tibial sesamoid (arrow). On the right side the second tibial sesamoid is bipartite (double arrow). Small arrows show the bilaterally present fifth tibial sesamoid.

Fig. 5. Case 4: A. B., male, 48 years old. Tibial sesamoids are bilaterally present beneath the second, third, and fifth metatarsal heads (arrow). The fifth metatarsal heads and sesamoids are slightly retouched. Note the traumatic deformity of the nail phalanx of the left big toe and also the old united fracture of the right fifth toe, showing that there was a possibility of injury, although the patient had no recollection of such an occurrence. The left third tibial sesamoid is bipartite (double arrow).

rudimentary bones, which are undergoing a process of backward development in man and are gradually lost. They do not become ossified until the beginning of the second decade. Their ossification may occur from two or more centers and may be incomplete, resulting in permanent congenital division.

CASE 5: *Calcareous Tendinitis of the Lumbrical and Interosseal Tendons near the Inconstant Sesamoid of the Left Second Toe.* K. B., professional ballerina, 33 years old, was referred to the author on Oct. 11, 1940, because of pain beneath the ball of the left second toe. The patient did not recall any definite injury, except for extensive dancing exercises several hours daily. She gave a history of rather sudden onset of pain, with no disability. She was able to continue dancing and walking without aggravation of pain. The pain was of steady nature and was relieved by rest. The findings on examination of the feet were essentially negative, except for moderate hallux valgus. The motion of the left second metatarsophalangeal joint was free but slightly painful on extreme hyperflexion. There was considerable tenderness strictly localized on the medial plantar aspect of the left second metatarsal head, corresponding to the usual location of the inconstant second tibial sesamoid.

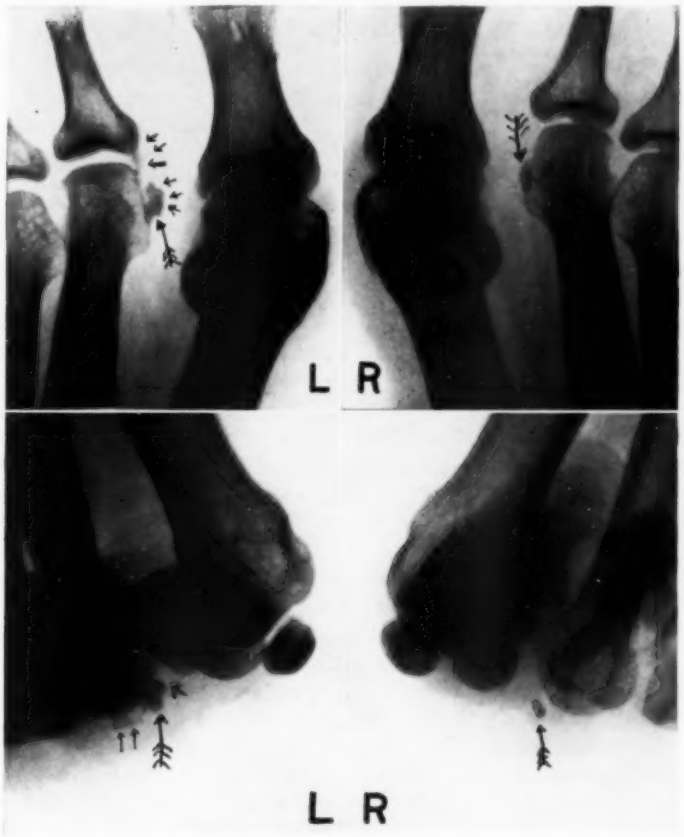
Roentgenograms (Figs. 6 and 7) of the feet in different positions showed the bilateral presence of the second tibial sesamoid, the one on the left side being surrounded by several small calcareous deposits, probably localized in the lumbrical and interosseal tendons.

Conservative treatment was tried for a while, without any definite relief. Later, on Dec. 3, 1940, the sesamoid, together with the calcareous deposits, was removed by another surgeon from a dorsal approach. At the end of three months, the patient was able gradually to resume her dancing exercises.

Comment: The possibility of congenital multipartite sesamoids or fracture was at first considered in this case. The clinical picture and the roentgenologic findings, however, showing a normal, well formed sesamoid similar to the one on the opposite side, except that it was surrounded by several irregular calcareous deposits, rather favor the diagnosis of tendinitis with calcification around the sesamoid. Unfortunately, the pathological report, which would have made possible a more precise diagnosis, could not be obtained.

SUMMARY

1. Attention is called to the existence of disabling symptoms caused by various



Figs. 6 and 7. Case 5: K. B. Above is a dorsoplantar view of both feet. Note the oblong right second tibial sesamoid. A similar sesamoid is present on the left side (large arrow). Several areas of calcification (small arrows) surround the left sesamoid; these extend to the basal phalanx apparently along the lumbrical and interosseal tendons.

Below is a special sesamoid view showing in cross-section the normal right second tibial sesamoid (large arrow) and the left second tibial sesamoid (large arrow), which is surrounded by areas of calcification (small arrows).

lesions of the inconstant foot sesamoids, the presence of which is frequently ignored.

2. A case of fracture of the inconstant left second tibial sesamoid is presented, with the pathological findings of the sesamoid removed at operation.

3. Three cases of congenital bipartite inconstant sesamoids of the foot are also given.

4. A case of calcareous tendinitis around the inconstant tibial sesamoid of the left second toe is reported.

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A Modified Classification of Bone Tumors[1]

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with a

Foreword

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A classification of bone tumors which will satisfy all interested groups is practically an impossibility, since the point of view of the roentgenologist is different from that of the orthopedic surgeon and that of the cellular pathologist. Certainly, no means has as yet been devised whereby the cellular structure of the tumor can be demonstrated on the roentgenogram.

In the revised classification of *Bone Tumors*, as presented by the Bone Tumor Registry in 1939, this fact has been partially taken into consideration, but not completely. Certainly, there is no way in which the roentgenogram can differentiate between the telangiectatic and the other forms of osteolytic osteogenic sarcoma.

There are many confusing terms used in the classification of bone tumors. For example, the term "osteogenic" is accepted by some as meaning bone-forming, whereas it actually means derived from cells which have the potentiality of producing bone. Thus an osteogenic sarcoma may or may not produce bone. "Periosteal" sarcoma is another term which is commonly used erroneously; actually, the tumor is an osteogenic sarcoma highly specific in its histology, its point of origin, and in its tendency to metastasize elsewhere in the osseous system. However, from the roentgen point of view, it can be recognized only as an *anatomic* type of osteogenic sarcoma.

"Giant-cell" sarcoma is a term commonly used in reference to benign bone lesions. Actually, there are two distinct groups of giant-cell tumors, one a benign giant-cell tumor, the other a malignant giant-cell sarcoma.

The classification of bone tumors by Budd and Macdonald, which follows, is a valuable contribution to the statistical study of bone tumors. Though it is of little value from a purely roentgenologic standpoint, it will give us a much better concept of those bone tumors in which we may expect five-year cures with proper treatment and management. K. S. D.

A CONSIDERABLE degree of uncertainty still exists in the minds of many clinicians and radiologists concerning the problem of a satisfactory nomenclature for tumors of bone. The confusion is often furthered by the variable interpretations assigned to certain words or phrases by different pathologists. Various approaches have been used to establish the several classifications most commonly employed, and these usually owe their origin to their author's interest in the interpretation of types of bone tumors according to patterns either of histological (1) or embryological (2) derivation. A third basis for classifying bone tumors is found in an emphasis of their gross anatomical and morphological features (3), in which the histological diagnosis is modified by such variants as the relation of the tumor to the periosteum or to the medulla, its osteolytic or osteoblastic tendencies, or extreme

[1] From the Los Angeles Tumor Institute, Los Angeles, Calif. This paper takes the place of that of Dr. Kenneth S. Davis, presented as an introduction to the Symposium on Bone Tumors, before The Radiological Society of North America, at The Twenty-seventh Annual Meeting, San Francisco, Dec 1–5, 1941. The other papers in the Symposium appear in the March issue of RADIOLOGY, pp. 247 and 253.

variations in vascularity (telangiectasia). Some classifications have used modifying descriptive terms from gross pathology as subheadings of principal divisions based on histogenetic origin.

The most widely accepted and, we believe, the most rational classification of bone tumors is that which has been evolved by the Committee of the Registry of Bone Sarcoma of the American College of Surgeons. Its nomenclature is based on histogenetic considerations, and in an admirable review of the whole subject accompanying the revision of 1939, Ewing (1) has described the evolution of this classification and the additions made necessary by observations during the preceding decade.

Our interest in this subject was the result of a study of the cured cases of bone sarcoma to be found in the Registry material, the results of which will be published elsewhere. We were primarily concerned in this review with malignant tumors having their origin in the connective tissues of bone, rather than those originating in vascular, hematopoietic, or adipose tissues. Our study developed the relative importance of primary fibrosarcoma of bone, which in the Registry classification is listed as one of the variants of the "osteogenic" series, while chondrosarcoma has been split off as a separate entity. Most connective-tissue sarcomata of bone are predominantly forming one of the three fundamental types of connective tissue, *i.e.*, fibrous, cartilaginous, or osseous. This leads to a prime terminological obstacle, the definition of the term "osteogenic sarcoma."

"Osteogenic" is a chameleonic expression which is used loosely and interchangeably to mean tumors originating in bone, or producing bone, or both. Ewing properly insists that its use should be limited to signify tumors *having their origin in bone*, and not necessarily forming bone. Its use in this sense is entirely rational and analogous to the use of the suffix in such terms as "bronchiogenic" carcinoma. With the object of an exact adherence to this meaning, we propose that the three types of primary connective-tissue sarcoma mentioned above be included under the generic term, osteogenic sarcoma. Phemister (4) was the first to establish clearly the claims of chondrosarcoma to separate recognition as a special type of bone tumor by reason of its clinical, roentgenographic, and microscopic features. The occurrence of primary fibrosarcomata of bone has been recognized by Ewing, Geshickter and Copeland, and others. We have established to our own satisfaction their considerable incidence, particularly in cured cases of bone sarcoma, and believe that they constitute a group of tumors sufficiently distinctive in their natural history and other features to merit a separate status equal to that of chondrosarcoma.

This leaves the problem of naming the third, or bone-producing member of the triad, and the term "osteosarcoma" is etymologically exact for this purpose. Used originally by Mallory, Ewing, Wright, and others, its connotation is that of bone production, and its use is identified with bone-forming and particularly sclerosing forms of sarcoma of bone. Its use to indicate all forms of bone-producing sarcoma is inescapable, for the word form adheres to accepted usage in the designation of other mesenchymal sarcomata.

Our primary purpose in offering a modification of the Registry classification for consideration is twofold. Of especial importance, we believe, is the necessity for adequate recognition of the fact that the connective-tissue sarcomata of bone are divisible into three main types. As a corollary to this is the claim for fibrosarcoma to equivalent ranking with osteosarcoma and chondrosarcoma, although it is numerically less important. A division such as this defines those tumors which have as their anlage the stem mesenchymal cell which may differentiate toward fibrous tissue, cartilage, or bone.

The second objective of the modification is an attempt to maintain a rigid adherence to the designation of bone tumors according to their histogenetic origin.

MODIFIED CLASSIFICATION OF BONE TUMORS

Type Tissue	Malignant	Benign
1. Connective	Osteosarcoma, Chondrosarcoma, Fibrosarcoma } Osteogenic sarcoma	Osteoma Chondroma
2. Undetermined	Malignant giant-cell tumor	Benign giant-cell tumor Epiphyseal chondromatous giant-cell tumor
3. Endothelial	(*a*) Angio-endothelioma (*b*) Diffuse endothelioma (Ewing's sarcoma)	(*a*) Plexiform angioma (*b*) Cavernous angioma
4. Hematopoietic		
Erythropoietic	(*a*) Erythrocytoma	
Myeloid	(*b*) Myelocytoma; myeloma	
Lymphoid	(*c*) Lymphocytoma	
Reticular	(*d*) Reticulocytoma	
5. Adipose	Liposarcoma	

For this purpose the Registry classification is expressed in terms of the type tissue of origin. In the instance of giant-cell tumors, proof as to their exact histogenesis is lacking. Their doubtful pathogenesis is illustrated by the conflicting claims of the proponents of their angiomatous or cartilaginous origin. Both of these claims seem at present to be unconfirmed and the histogenesis of giant-cell tumors must be accepted as undetermined. As in the Registry classification, Ewing's sarcoma is accepted as of endothelial rather than myelomatous origin. Reticulum-cell lymphosarcoma is included here with those tumors of hematopoietic tissue origin, and the term reticulocytoma adopted to obtain a uniform nomenclature. Although reticulum-cell sarcoma primary in bone follows a less aggressive clinical pattern than other forms of myeloma, we find it reasonable to include it with the general group of tumors arising from specific marrow cells.

No attempt has been made to include variants based on the anatomical location or gross characteristics of the tumor. This omission may seem to detract from the importance of certain well defined forms, particularly of osteogenic sarcoma, familiar to the clinician and roentgenologist. But such terms as medullary, central, subperiosteal, and sclerosing may be applied alike to osteosarcoma, chondrosarcoma, and fibrosarcoma. Telangiectatic forms of osteosarcoma are usually those exhibiting a pattern of rapid growth and invasive characteristics synonymous with highly malignant tumor. Osteoblastic and osteolytic also are descriptive terms indicating the behavior of the tumor or the character of the stromal response evoked by its presence. Parosteal and capsular sarcomas seem to be varieties of fibrosarcoma and may not be true primary bone tumors. Any of these terms may be used to describe suitably the roentgenographic and gross anatomical features of primary bone tumors.

SUMMARY

A modification of the classification of bone tumors is presented which has as its object an adherence to the principle of histogenetic derivation. The type tissue of origin is indicated as far as possible on the basis of generally accepted concepts. Fibrosarcoma is recognized as a separate entity in the group of connective-tissue sarcomas of bone. The modification is based on the 1939 classification of the Registry of Bone Sarcoma.

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Roentgen Pelvimetry and Fetometry: A New Formula[1]

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IN *Surgery, Gynecology and Obstetrics* for May 1941 there is a most excellent article by Dippel and Delfs, entitled, "The Accuracy of Roentgen Estimates of Pelvic and Fetal Diameters." After reviewing much of the work that had gone before, particularly that of Thoms, Ball and Hodges, they describe the sources of error in such estimates, calculate their probable values, and mention some of the disadvantages inherent in each of them. They also rightfully conclude that any one of the methods will give sufficiently accurate results if the technic is meticulously observed. Farther on in the same article they submit the equation $F = \frac{K}{P + K}$ (based upon the familiar stereoscopic tube shift technic), where F is defined as a correction factor which must be applied to the projection of any given diameter in order to obtain its true value; K the shift of the tube; P the parallax shift of the image. Since small errors in the measurement of tube shift (K) introduce large errors into the final determination, they have recourse to the use of a marker or template of known length, so placed that its image will appear upon each of the stereoscopic films. The projection of the template can be measured on the film, and F is found by dividing its known length by the length of its projection. Parallax shift is also measurable on the films. Since the only unknown in the equation is K (tube shift), that term is calculated without difficulty. Having determined a correct value for K, the same formula may be used in calculating the correction factor (F) for the pelvic and fetal diameters, provided they lie reasonably parallel to the plane of the film.

It occurred to the author that by making use of the same technic the whole problem might be reduced to a single formula, by means of which all diameters projected upon a given pair of films could be directly calculated.

Since tube shift (y') has the same value with respect to the template and the diameters to be measured, it is obvious that it can be determined simultaneously in terms of template length, template shift, and template projection, and diameter length, diameter shift, and diameter projection, thus:

$$y' = \frac{Ay}{A' - A} \qquad \text{Eq. (16)}$$

$$y' = \frac{Bz}{B' - B} \qquad \text{Eq. (17)}$$

where A is the diameter sought, A' the length of its projection, y the parallax shift of A', B the length of the template, B' the length of its projection, and z the parallax shift of B'. Since things equal to the same thing are equal to each other,

$$\frac{Ay}{A' - A} = \frac{Bz}{B' - B} \qquad \text{Eq. (18)}$$

Solve for A, and we get,

$$A = \frac{A'Bz}{Bz + y(B' - B)} \qquad \text{Eq. (23)}$$

An analysis of this formula will show that all terms used in the solution of A, with the single exception of B, are measured on the films, and B is a known constant. Furthermore, there are no terms representing target-film, target-object, or object-film distances. Therefore, any diameter, either fetal or pelvic, which fulfills the condition of parallelism laid down in the introductory paragraph can be easily determined. It will also be noted that the terms Bz and $B' - B$ are constants for any given pair of films, so that the same value may be used in any calculation based upon the same pair of roentgenograms. By

[1] Accepted for publication in December 1942.

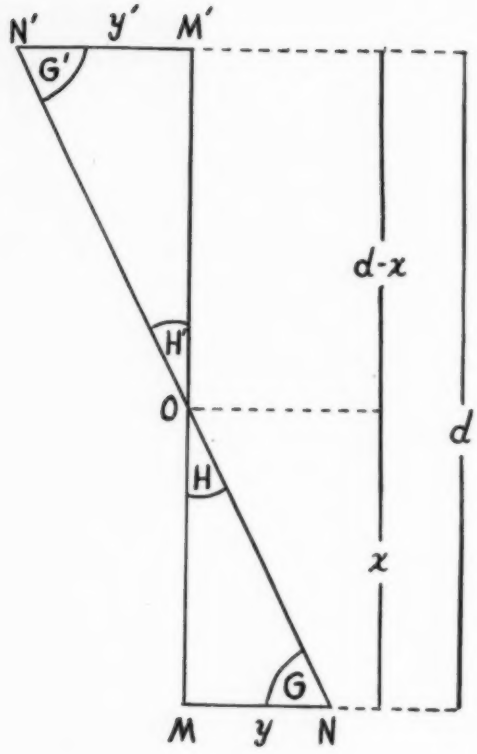

Figure 1.

$$\frac{y'}{y} = \frac{(d-x)}{x} \qquad \text{Eq. (1)}$$

$$xy' = dy - xy \qquad \text{Eq. (2)}$$

$$xy' + xy = dy \qquad \text{Eq. (3)}$$

$$x(y' + y) = dy \qquad \text{Eq. (4)}$$

$$x = \frac{dy}{(y' + y)} \qquad \text{Eq. (5)}$$

making the template exactly 10 cm. long, further simplification is achieved.

The appended diagrams are submitted in order that the various steps in the evolution of the formula may be followed, and their complete logic mathematically proved.

Referring to Figure 1, let us assume that the target of the tube is at point N', its distance from the plane of the film being d. The image of the object O, whose distance from the film is x, will fall upon the point N. Now, if we shift the tube to the point M', through a distance y', the image of the object O will fall upon the point M and will have shifted through a distance y. Connect these points by straight lines and we create the triangles $M'N'O$ and MNO, whose bases are y' and y, respectively, and whose altitudes are also, respectively, $d - x$ and x. Since the angles H' and H are equal, being the vertical angles formed by the intersection of two straight lines, and the angles G' and G are equal, being the alternate interior angles formed when two parallel straight lines are intersected by a transversal, it follows that all corresponding angles are equal and, therefore, the two triangles are similar. One of the properties of similar triangles is that the ratio between any two corresponding sides is equal to the ratio between their altitudes. Therefore,

$$\frac{y'}{y} = \frac{(d-x)}{x} \qquad \text{Eq. (1)}$$

Solve for x and we get

$$x = \frac{dy}{(y' + y)} \qquad \text{Eq. (5)}$$

An interesting point about this equation is that, by using the Dippel-Delfs method of calculating tube shift, very accurate values for object-film distance can be determined. This is particularly true, since target-film distance is easily measured, and small errors in its measurement do not introduce clinically significant errors into the result.

Figure 2 represents the condition prevailing when a linear object (pelvic diameter for instance) A, at a distance x from the film, is projected upon it from a point T at a distance d from the plane of the same film. Here, as in Figure 1, we have two similar triangles. They have a common apical angle P, and the angles L' and L are equal, being the corresponding angles formed when two parallel straight lines are intersected by a transversal. Thus we have two triangles with two corresponding angles equal; the third angles are therefore equal and the triangles are similar. These triangles being similar, the ratio between their altitudes is equal to the ratio between any two corresponding sides. Hence

$$\frac{A}{A'} = \frac{(d - x)}{d} \qquad \text{Eq. (6)}$$

In Figure 1 it was demonstrated that

$$x = \frac{dy}{(y' + y)} \qquad \text{Eq. (5)}$$

Substitute for x its value, solve for A, and the result is

$$A = \frac{A'y'}{(y' + y)} \qquad \text{Eq. (11)}$$

Now, assuming that the stereograms were made according to the technic which includes the template of known length, let us proceed with the evolution of the new formula. Solve equation (11) for y', thus.

$$A = \frac{A'y'}{(y' + y)} \qquad \text{Eq. (12)}$$

$$Ay' + Ay = A'y' \qquad \text{Eq. (13)}$$

$$A'y' - Ay' = Ay \qquad \text{Eq. (14)}$$

$$y'(A' - A) = Ay \qquad \text{Eq. (15)}$$

$$y' = \frac{Ay}{(A' - A)} \qquad \text{Eq. (16)}$$

By the same process of reasoning it can be shown that

$$y' = \frac{Bz}{(B' - B)} \qquad \text{Eq. (17)}$$

where B is the length of the template, B' the length of its projection, and z the parallax shift of B'. Since y' has the same value in both equations (16) and (17), it is obvious that

$$\frac{Ay}{(A' - A)} = \frac{Bz}{(B' - B)} \qquad \text{Eq. (18)}$$

$$AB'y - ABy = A'Bz - ABz \qquad \text{Eq. (19)}$$

$$AB'y - ABy + ABz = A'Bz \qquad \text{Eq. (20)}$$

$$A(B'y - By + Bz) = A'Bz \qquad \text{Eq. (21)}$$

$$A = \frac{A'Bz}{(B'y - By + Bz)} \qquad \text{Eq. (22)}$$

$$A = \frac{A'Bz}{Bz + y(B' - B)} \qquad \text{Eq. (23) Q.E.D.}$$

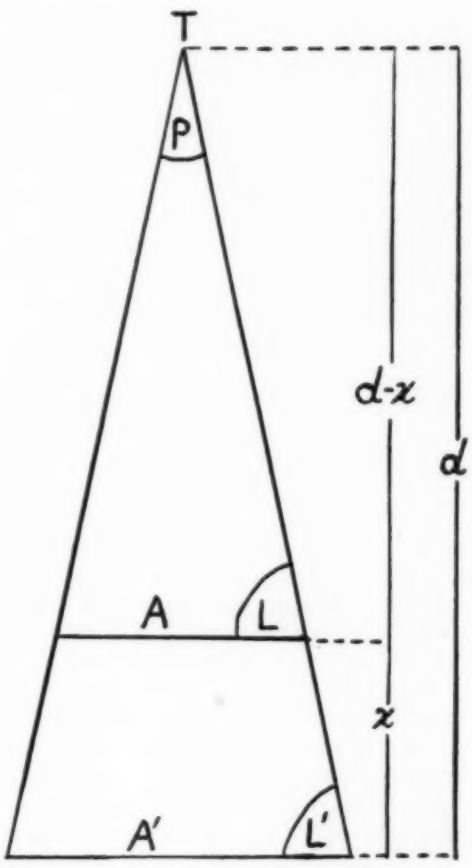

Figure 2.

$$\frac{A}{A'} = \frac{(d - x)}{d} \qquad \text{Eq. (6)}$$

$$Ad = A'd - A'x \qquad \text{Eq. (7)}$$

but $x = \frac{dy}{(y' + y)}$. Substitute in above equation for x

$$Ad = A'd - \frac{A'dy}{(y' + y)} \qquad \text{Eq. (8)}$$

Divide by d

$$A = A' - \frac{A'y}{(y' + y)} \qquad \text{Eq. (9)}$$

$$A = \frac{A'y' + A'y - A'y}{(y' + y)} \qquad \text{Eq. (10)}$$

$$A = \frac{A'y'}{(y' + y)} \qquad \text{Eq. (11)}$$

It was deemed advisable to test this formula by engineering rather than by clinical methods. The latter do not lend themselves to precise determination either on the operating table or in the postmortem room. Even with a dried pelvis an experiment of this character cannot be car-

ried out with the desirable nicety. A phantom, very much like the template, but with the points set at an arbitrary but easily measurable distance, was constructed. This distance was carefully measured and used to represent the unknown diameter, A. The template, which has been used in all clinical applications of this formula, is exactly 10 cm. long. The data were as follows:

A = 15.70 cm. (measured)
A = 15.674 cm. (calculated)
A' = 21.50 cm.
B = 10.00 cm.
B' = 12.50 cm.
y = 5.50 cm.
z = 3.70 cm.
Error (15.70 − 15.674) = 0.026 cm.

It is conceded that this order of precision is not attainable in clinical practice and is, as a matter of fact, in part accidental; but the experiment does prove that, with proper technic, the results will be extremely accurate.

The method of application is quite simple. One should make, or have made, a template from which the terms B, B' and z must be determined. The writer's, consists of a strip of bakelite upon which are mounted two pointed markers. These markers are of metal and are set exactly 10 cm. apart. This setting is never changed. The template is mounted upon a small stand that can be rigidly attached to one side of the table top, and so adjustable as to make possible its positioning within the radiographic film area so that it will register on the two films simultaneously with the pelvic and fetal shadows. It is, of course, essential that the template remain fixed and parallel to the plane of the film throughout the exposure of both films. It will also be necessary to fix two markers to the cassette clamp of the Bucky diaphragm These may be made of flat brass and soldered to the cassette clamp. They, too, must show on both films and will serve to help proper registration so that the shifts y and z may be accurately measured.

Assuming that we wish to measure any one of the diameters shown in an anteroposterior view, the patient is placed upon the table in the supine position and so adjusted that true anteroposterior views may be obtained. The template is fixed in position and adjusted to any convenient height. The tube is set at the desired height and locked so that this adjustment cannot change. The Bucky diaphragm is also locked so as to prevent movement between the exposures. A cassette is inserted and the first exposure made. The tube is shifted through any convenient horizontal distance, another cassette inserted, and a second exposure made.

The two films, when processed, will show, besides the anteroposterior projections of the pelvis, the shadows of the template and the registration markers. Between the proper anatomical landmarks draw the lines representing the four diameters (transverse, bi-ischial, bi-tuberous, and outlet). It may be well to identify these diameters as they are drawn in order to avoid confusion. On either of the films measure the length of the projected diameter. This measurement is the term A'. Also measure the projection of the template. This will be the term B'. Now place one film over the other and measure the distance (vertical) between the corresponding diameters. This figure is y in the equation. In a like manner measure the distance between corresponding points on the template shadow; this measurement will represent the term z.

Since the terms Bz and $B' - B$ are constants for any given pair of films, they may be calculated first and the same values used throughout.

There are many simple ways of finding the true conjugate. These are well known and need not be discussed here.

The technic described above differs in no respect from that used by Dippel and Delfs in their method, and no credit for it is claimed by the author.

Our experience, though limited, has demonstrated the practicability of this formula. It was decided, however, to submit it to other workers in order that independent and unprejudiced tests might be

made. Dr. A. Louis Dippel was kind enough to have the mathematics checked and has tried the method clinically in a number of cases. He informs the author that the results have been accurate and the application not difficult. Dr. Palmer E. Wigby has made calculations by the Dippel-Delfs method and by the author's and has found that both lead to the same results.

CONCLUSIONS

(1) A new formula for roentgen pelvimetry based upon the Dippel-Delfs technic is submitted.

(2) Mathematical and experimental proof of its validity are described.

(3) It reduces the problem of pelvimetry and fetometry to a single formula.

(4) All calculations can be rechecked in case of palpable error, without recourse to further radiographic procedure.

(5) Unusual or uncomfortable positioning of the patient is rendered needless.

NOTE: The author wishes to acknowledge, with sincere gratitude, the help and encouragement accorded by Doctors Dippel and Wigby.

Department of Radiology
Jefferson Davis Hospital
Houston, Texas

Clinico-Pathological Conference[1]

UNIVERSITY OF MINNESOTA HOSPITALS, MINNEAPOLIS, MINNESOTA

E. T. Bell, M.D., Leo G. Rigler, M.D., Wesley Spink, M.D., and C. J. Watson, M.D.

Dr. Lima (presenting the case history): A 60-year-old white male, a cabinet-maker, was first admitted to the hospital on July 9, 1942, after study in the Out-Patient Department two weeks previously. His complaints were weakness, anorexia, loss of weight, and a dry cough, all beginning about March 1942. Some seven weeks prior to admission the sputum became purulent and the breath bad, but there was no hemoptysis. There were no respiratory symptoms prior to the present complaint. The patient had lost 47 pounds in weight during the past year.

The temperature was 100.8°, pulse 80, blood pressure 128/80. The patient appeared chronically ill and was raising large amounts of sputum. On physical examination there was evidence of atrophy of the pectoral muscles on the right side with greater expansion on the left. Breath sounds appeared normal. There were numerous crepitant medium râles at the right base posteriorly. Marked clubbing of the fingers and toes was present. There was no cyanosis.

The urine was negative. The blood showed 11.4 gm. of hemoglobin and 15,600 white blood cells, 86 per cent of which were polymorphonuclears.

Sputum was profuse and purulent. Numerous examinations were made and on one occasion acid-fast bacilli, atypical of the bacterium of tuberculosis, were found. Gastric washings were then undertaken and acid-fast bacilli were discovered. These were injected into a guinea-pig. Concentration tests of the sputum were negative.

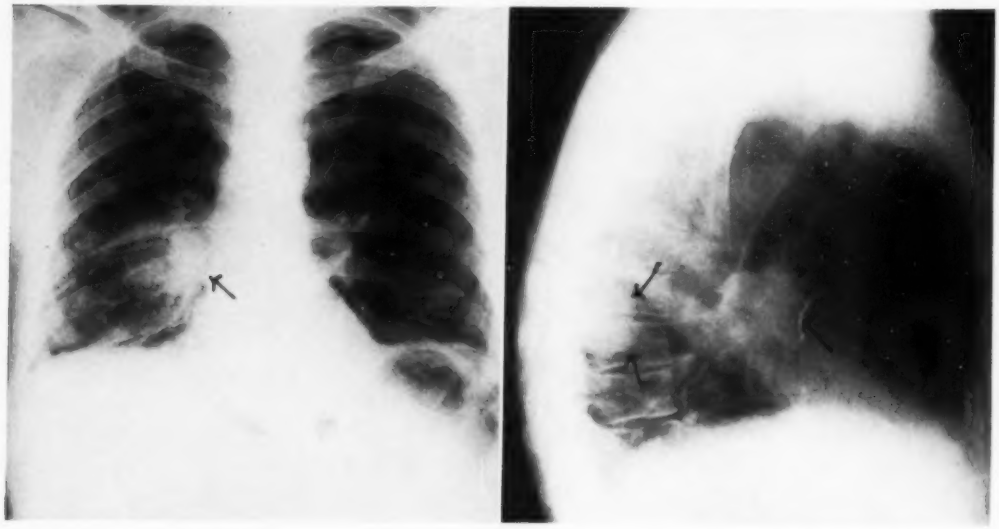

Fig. 1. Postero-anterior roentgenogram (June 29, 1942) showing mass in medial portion of right lung with atelectasis of lower lobe.

Fig. 2. Lateral roentgenogram (June 29, 1942) showing mass in posterior portion of lower lobe (posterior arrows), mass around hilum (arrow), and broad band of increased density in superior portion of lower lobe, indicating atelectasis.

[1] From the Departments of Radiology, Pathology, and Internal Medicine of the University of Minnesota. Prepared by Leo G. Rigler, M.D.

Dr. Rigler (demonstrating the roentgen findings): Roentgen examination of the chest was first made June 29, 1942. A postero-anterior view (Fig. 1) showed a large mass apparently in the right hilum. This was not sharply demarcated and there was some extension beyond it into the surrounding lung. There was slight displacement of the trachea to the right. The right main bronchus could be made out, filled with air, extending up to the point of the mass, where there appeared to be some constriction. The diaphragm was slightly elevated. There was a diffuse mottled density through the right lower lobe suggesting some atelectasis. A lateral roentgenogram (Fig. 2) showed a large mass in the right hilum with infiltration out into the lung. In addition, there was present a smaller, rounded area of density in the apex of the lower lobe, very far posterior. It is apparent that, in the postero-anterior view, this shadow is lost within that of the mass in the hilum. There were found, also, a rather broad band of increased density along the superior margin of the lower lobe and some diffuse peribronchial mottling through the remainder of the lobe, suggesting a low-grade atelectasis. Bronchography was done on July 15, 1942, after the placement of a catheter in the right main bronchus (Fig. 3). A marked constriction of the lower lobe bronchus could be made out just beyond the first bifurcation of the right main bronchus. The major branches of the right main bronchus were well filled out, but a defect was observed in the bronchial distribution posteriorly at the point of the nodule previously seen.

Roentgen Diagnosis: Peripheral carcinoma, primary in apex of the right lower lobe; metastasis to peribronchial lymph nodes at right hilum, with infiltration about lower lobe bronchus. The possibility of a primary tumor in the right lower lobe bronchus with metastasis to the periphery was also considered.

Re-examination of the chest on Aug. 1 showed some slight decrease in the size of the shadow at the root of the right lung. Otherwise the findings remained essentially the same. An examination of the urinary tract was undertaken to exclude hypernephroma or tuberculosis. The right kidney appeared entirely normal. On excretion urography the kidney pelvis and ureter were normal. On the left side the kidney appeared slightly enlarged and excretion was somewhat diminished, but no clear evidence of pathology could be made out. Re-examination of the chest on Sept. 17 showed no particular change since the previous examination. A further examination on Sept. 20, twelve hours before death, showed the left diaphragm considerably elevated by gas underneath it. There was a triangular area of density in the middle portion of the right lung in addition to the mass previously seen in the root of the lung. This new area of density suggested a superimposed pneumonia or a more pronounced atelectasis.

Fig. 3. Bronchogram (July 15, 1942) showing constriction of right lower lobe bronchus of diffuse character (arrow).

Dr. Lima: Bronchoscopy was done

July 3, 1942, and a mass was seen in the right lower bronchus, from which a biopsy was obtained. Microscopic examination revealed only granulation tissue. Bronchoscopy was repeated July 15. There again appeared to be some changes in the mucosa of the bronchus, but biopsy showed only inflammatory tissue and no evidence of tumor.

After a few weeks in the hospital the patient's temperature became normal; the cough and the sputum disappeared, and he felt well. Pneumonectomy had been considered because of the diagnosis of tumor, but when tubercle bacilli were found, this procedure was not undertaken.

Diagnostic Impressions: (1) Bronchogenic carcinoma, (2) Question of tuberculosis.

It was thought wise to wait until the reports of the guinea-pig inoculation were available. The patient was accordingly discharged Aug. 8. He returned on Aug. 17, having been fairly well until five days prior to this admission, when he began to cough and to experience night sweats with chills, fever, and chest pain. There were increasing dyspnea and wheezing and the sputum became yellow and thick. The temperature at this time was 99.4°, pulse 80, and blood pressure 140/70. The patient appeared acutely ill, was cyanotic and wheezing, and had labored respiration. Resonance was increased bilaterally. The breath sounds were harsh. There were occasional musical râles with numerous sticky râles at the right base. Loud rhonchi were heard everywhere. At this time the white blood count had risen to 19,000. The temperature rose to 102° on the second day and then dropped to normal. Sulfadiazine, aminophyllin, and oxygen inhalations were given during the final illness, but without effect. Death occurred on the third day after this entrance.

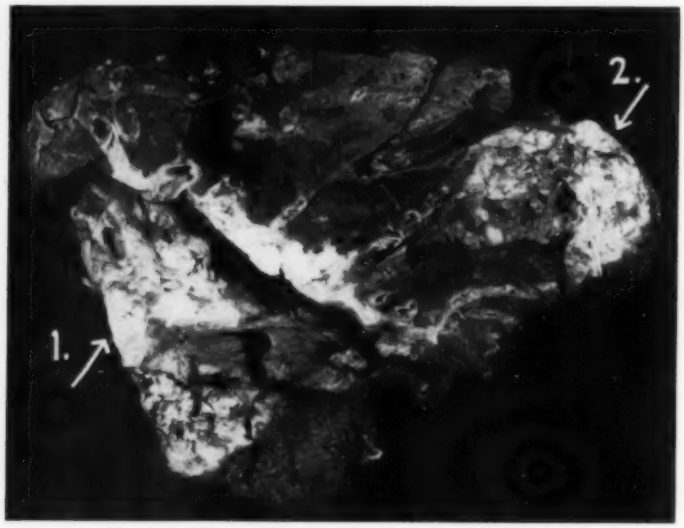

Fig. 4. Autopsy specimen of lung showing peribronchial tumor (arrow No. 1) and tumor in apex of right lower lobe (arrow No. 2).

Dr. Bell: From what portion of the bronchus was the biopsy obtained?

Dr. Lima: It was thought to be from the main trunk of the lower lobe.

Dr. Adkins (reporting the autopsy): The autopsy findings were of interest largely with regard to the right lung (Fig. 4). A large mass was found around the root extending up to the carina between the trachea and the esophagus, upward into

the mediastinum and along the upper lobe bronchus, but it was particularly prominent around the right lower lobe bronchus; the latter was distinctly constricted. Some mucosal erosion in the right lower lobe bronchus was clearly made out, which on microscopic examination showed a tumor. The mass itself was somewhat necrotic and yielded pus when pressure was applied. A separate carcinoma in the apex of the right lower lobe could be clearly made out. It had much the same characteristics as that around the root and it appeared most likely to be a metastasis. The left main bronchus contained thick, glairy mucus. The remainder of the autopsy findings were of no significance.

Dr. Bell: Note the peripheral position of the lesion. These peripheral carcinomas are relatively uncommon. Almost all the carcinomas of the lung are, of course, bronchogenic. Some may arise from the smaller bronchi, but the vast majority arise in the major trunks.

Dr. Rigler: You will recollect that Westermark reported that at least 50 per cent of the bronchogenic carcinomas which he observed arose in the peripheral bronchi and extended proximally to the major bronchi.

Dr. Bell: The mucosa of the right lower lobe bronchus showed a rather superficial erosion and ulceration, but the findings are so characteristic that I believe this is the source of the lesion and that the tumor in the apex of the lower lobe is the metastasis. In our experience this is the common sequence of events.

Dr. Rigler: Is the superficial character of the ulceration the reason why the bronchoscopic biopsy was negative?

Dr. Bell: Probably the area was somewhat too small to obtain a good specimen, although if the biopsy had been done in exactly the right location, the diagnosis could readily have been made.

Dr. Watson: It is worth observing that this patient had distinct clubbing of the fingers. It is interesting that this may occur rather rapidly in the case of tumors; it is usually much slower in chronic bronchiectasis and other chronic inflammatory processes.

Dr. Bell: How do you explain the clubbing?

Dr. Watson: Anoxemia is given as the most common explanation, but it is insufficient, in that clubbing of the fingers occurs with certain liver conditions in which there must be some other factor, possibly a toxic one; the explanations are certainly not adequate.

Dr. Bell: Attention should be directed to the acid-fast bacilli in the gastric contents. This is definitely not a reliable finding unless confirmed by culture or guinea-pig inoculation. Likewise, the report of atypical tubercle bacilli in the sputum is unreliable without confirmation from guinea-pig inoculation or careful culture study.

Dr. Watson: The unfortunate feature of the finding of these bacteria simulating tubercle bacilli is that it causes delay in treatment until the cultures or the guinea-pig inoculation can be properly studied. It should be borne in mind, also, that in occasional cases tuberculosis may simulate carcinoma very closely. We had one such case here which came to operation, in fact, because it was thought to be carcinoma.

Dr. Spink: What was the result of the Mantoux test?

Dr. Lima: Positive.

Dr. Spink: Were cultures taken of the thick, glairy mucus found in the left lower lobe bronchus?

Dr. Adkins: No cultures were made, but smears were made and were negative.

Dr. Spink: One interesting feature of this case was the great improvement following rest in bed, which one might not expect from carcinoma of the lung. Because of the finding of the acid-fast organisms and the clinical improvement, we were led somewhat astray, although most of us still felt that this was a bronchogenic carcinoma.

Dr. Watson: It is a striking feature of bronchogenic carcinomas, in contrast to other types of cancer, that they may improve under favorable conditions and the

patient may even gain weight. We have observed this a number of times.

Dr. Bell: It seems to me that the improvement that one sees occasionally in carcinoma of the lung, without any real therapeutic procedure, is due to the fact that a large part of the causative factor in the symptoms is the infection and obstruction, and this may be relieved under various conditions, spontaneously.

Dr. Rigler: The presence of infection and obstruction often accounts likewise, for the striking temporary improvement which may occur after irradiation. It may be partially an effect of the radiation upon the inflammatory tissue, but also there is a sufficient reduction of the obstructing mass to permit reaeration of the lung. A large part of the roentgen findings is the result of the inflammation and the atelectasis from the obstruction. The roentgenogram may thus also exhibit changes indicative of improvement.

Dr. Bell: Can you tell us whether this tumor was situated so that it could possibly have been operable? Could the lung have been removed?

Dr. Adkins: No, the tumor extended well up to the carina, around the trachea and back to the esophagus.

Dr. Bell: The microscopic examination shows the tumor in the mucosa of the right main bronchus, which is ulcerated. Biopsy at this site would have shown definite histologic evidence of carcinoma. The tumor in the bronchus at this point is a solid type of glandular carcinoma in close contact with the wall of the bronchus in the form of cords. In some areas the whole process looks inflammatory and there is no evidence of tumor whatever. The histology of the tumor is not the same everywhere. Some areas look like adenocarcinoma, some appear strikingly like squamous carcinoma, and there are a few areas of small-cell tumor. If enough blocks were made from the average case, a similar mixture of types would be found. The types seem to blend. There are visible areas of necrotic tumor. These are very easily destroyed by irradiation, as they are almost dead already, and as a result a transient improvement may occur without affecting the eventual progress of the case to any appreciable degree. The microscopic findings in the peripheral tumor are very similar and are suggestive of metastasis.

Postmortem Diagnosis: Carcinoma of right lower lobe bronchus with metastasis to apex of right lower lobe and extension into mediastinum.

SUMMARY

A patient with symptoms suggestive of carcinoma of the lung, but without hemoptysis, showed roentgenographic evidence of two tumors. Because of the finding of bacteria simulating tubercle bacilli, both in the sputum and the gastric washings, doubt was thrown upon the diagnosis. The failure to obtain a positive biopsy on bronchoscopy and transient improvement on bed rest likewise led to conservative treatment. At autopsy a primary ulcerating adenocarcinoma of the right lower lobe bronchus was found, with extension to the surrounding lung, up to the carina, and with a metastasis in the apex of the lower lobe. The anatomical findings bore out the roentgen findings to a remarkable degree. While in this instance pneumonectomy would have been impossible, in other cases the delay necessary to determine the results of culture of the bacteria or of animal inoculation might be a critical factor in the possibility of radical surgery. The difficulties in the early diagnosis of bronchogenic carcinoma, even with all the diagnostic procedures at our command, are well illustrated.

A New Surgical Table Top and Cassette Holder for Surgical Roentgenographic Examinations of the Hip[1]

VIRGIL L. BARNARD, R.T.

Los Angeles, Calif.

ONE OF THE MOST difficult tasks in roentgenography is that of obtaining a true lateral projection of the neck of the femur. When this is required in conjunction with nailing the fractured neck, the difficulties are increased by the necessity of maintaining surgical asepsis during the procedures essential to secure the roentgenogram.

There have been many attempts to overcome the difficulties inherent in this procedure but, in general, they have not resulted in true lateral views of the head and neck of the femur. An approximately lateral projection may be secured by flexion of the thigh, but it is practically impossible to reproduce the amount of

Fig. 1. Surgical table top and cassette holder in position on operating table. Note tunnel open on both sides.

[1] Awarded "Certificate of Merit" at the Twenty-seventh Annual Meeting of the Radiological Society of North America, San Francisco, Calif., Dec. 1–5, 1942.

From the Department of Radiology, Queen of Angels Hospital, Los Angeles, Calif. Paper accepted for publication in February 1943.

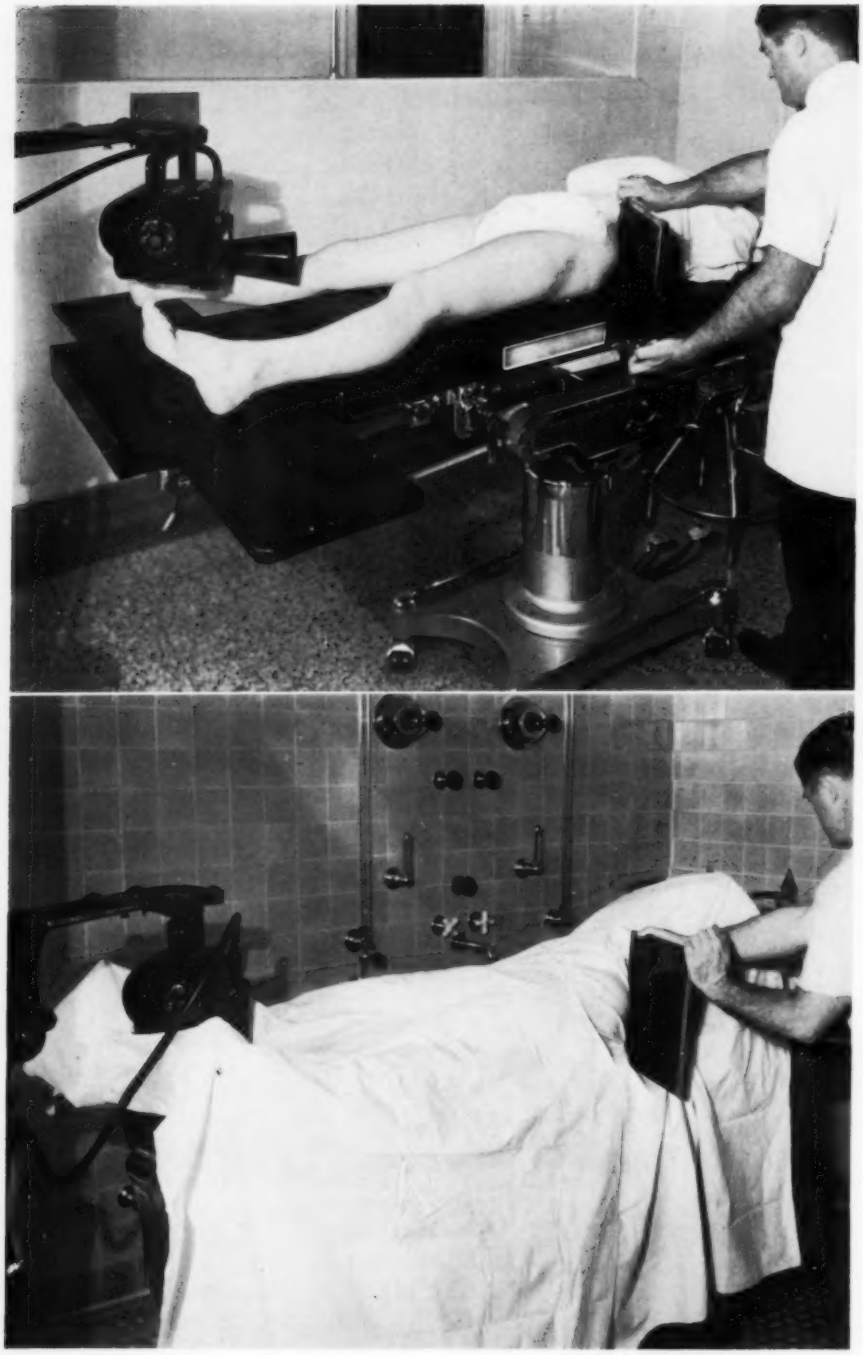

Fig. 2 (above). Cassette in position for true lateral view of the hip.
Fig. 3 (below). Large sterile table cover placed over patient during surgical procedure. Cassette is in same position as in Fig. 2.

Fig. 4. Showing centering of head and neck of femur.

flexion in other patients and there is some hazard if the nail should chance to protrude through the head or neck of the femur.

The ideal would be a procedure with which one might reasonably hope to secure a true lateral projection of the femoral neck and head with regularity, in as brief a time as possible, and without disturbance of the sterile drapes when the work is done in conjunction with surgery. In an attempt to approximate this ideal, there is here presented a combined surgical table top and cassette holder which has been employed in the Queen of Angels Hospital for several years, with general satisfaction.

The table top (Fig. 1) is constructed of flawless plywood covered with formica (a plastic similar to bakelite), which is unaffected by the various agents used in skin preparation. It is made to fit the top of the surgical table on which it is to be used and measures approximately 6 feet in length and 20 inches in width. Its thickness, which is about $2^1/_2$ inches, when added to the average thickness of the buttocks places the acetabulum and head and neck of the femur for the lateral projection in approximately the center of a 10×12-in. film.

An angle of 127° with its apex directed toward the patient's head is cut into both sides of the table top with an opening large enough to permit proper film placement with any degree of abduction of the leg which may be found necessary (Fig. 2). For a lateral view this permits the cassette to rest on its edge on the surface of the operating table. A tunnel through the table top measures 20×20 in. and is open on both sides, thus permitting the

Fig. 5. Lateral view of neck of femur with pin in position.

film for the anteroposterior projection to be placed on a sliding tray.

The patient is placed in position (Fig. 2) so that the crest of the ilium on the injured side is below the angle. The cassette may thus be placed in the angle and crowded into the patient's side between the iliac crest and the lower ribs. When this is done before the patient has been prepared for surgery, one may then be sure that the acetabulum and head and neck of the femur will be approximately in the center of a 10×12 in. film (Fig. 4).

When the pin has been placed in the femoral neck a large sterile cover is placed over the patient (Fig. 3). It should be large enough to hang down well on each side and should be left rather loose over the angle in order that the cassette may rest on top of the operating table. Care must be taken that all instruments have

been removed from the region of the angle so that the cassette may be crowded well into the patient's side. The cassette is held in this location by a nurse. The tube is quickly positioned and the exposure is made. The film for the anteroposterior projection is then placed in the sliding tray and slid under the patient from the uninjured side, the necessary adjustments of the x-ray tube are made, and the film is exposed.

If one has available a small dark room very near the surgery and employs rapid developing and fixing solutions, a roentgenogram may be made and returned for the surgeon's study within a period of six minutes. After a satisfactory film has been made, the large cover which has been draped over the patient and which is now contaminated is removed, leaving the original sterile field untouched. A new table covering must be added each time a film is to be made.

SUMMARY

1. There has been presented a new type of cassette holder for use in securing true lateral projections of the hip joint, particularly adaptable to roentgenography during surgical procedures.

2. The cassette holder is easy to use and saves a great deal of time.

3. Both anteroposterior and lateral projections of the femoral neck and head may be obtained without flexing the thigh or moving the patient.

4. The entire procedure may be carried out without the slightest danger of contaminating the surgical field.

2301 Bellevue Ave.
Los Angeles, Calif.

Classification and Filing in Department of Roentgenology: Standard Nomenclature[1]

STELLA FORD WALKER

Medical Record Library, Cook County Hospital

CREATING A classification is no small task. The task is never finished so long as new ideas, facts, and technics develop and departments grow and change. If you arrange a classification for your department, it will start out trim and simple. Then there will be additions. You become accustomed to its eccentricities and less critical of its logical development. It is apt to wind up a hodge podge of anatomic, etiologic, and technical terms. It may be to your advantage to select a classification ready made even though you may be critical of the handling of certain details of personal interest in such classification.

The classification selected should be:

(1) A *live* classification, kept up to date and revised periodically.
(2) Practical—not too cumbersome, but adequate, easily expanded or contracted depending upon the size of the institution served.
(3) Adjustable, flexible, to reflect any change in interest or change in type of work done in the department.
(4) Satisfactory for scientific requirements, but usable by lay assistants.
(5) Generally accepted.

When various institutions develop individual classifications it is difficult to change toward uniformity. Such changes involve waste of time and money. It would seem wise for radiologists to give some thought to uniformity. The same system may be followed in the therapeutic and diagnostic divisions of the roentgenologic department, in such department and the record library of an institution, and in roentgenologic departments of different hospitals and clinics—all in the interest of research, comparative statistics, and convenience of personnel.

In answering the above list of requirements the *Standard Nomenclature of Disease* has distinct advantages:

(*1*) *A live classification.* It has had a regular development under careful direction since 1928. The medical and surgical societies have criticized each section of the nomenclature, as urology, ophthalmology, and so on. Recently it was taken over by the American Medical Association (3d Ed., 1942), and constant revision and periodic publication are planned under the auspices of the Association. Other classifications have been discontinued in so far as revision and publication are concerned.

(*2 and 3*) *Practical and adaptable.* The *Standard Nomenclature* looks complicated and even forbidding in book size. In practice it is extremely logical and comparatively simple. It is based upon eleven topographic main divisions associated with twelve etiologic classifications. These main divisions may be sufficient for a small department. In one or more fields, if the bulk of work requires it, you may use the first group of subdivisions. For example, the third division is the respiratory system; 31 is the nose, 32 the sinuses, on to 36 lungs and 37 pleura. The third figure provides further division—363 upper lobe of right lung. These topographic figures are combined with etiologic symbols: 360-1 indicates infection of the lung, -8 tumors, -889 carcinoma of the lung, -889.9 secondary carcinoma of lung. Another example: the sixth division is the digestive system, 687 gallbladder, 687-615 calculus of gallbladder.

(*4*) *The scientific interest* of the radiologist and associated physicians is of first importance, but a printed classification with adequate indices enables lay assis-

[1] Presented before the Radiological Society of North America, at the Twenty-eighth Annual Meeting, Chicago, Ill., Nov. 30–Dec. 4, 1942.

tants to be nearly self-sufficient in the work of classification, filing, and locating material. The number codes serve when a punched-card system or other mechanical device is used for analyzing material for periodic reports or scientific studies.

(5) *Acceptance.* The *Standard Nomenclature* is not at present in use in all institutions. As noted above, the change over from one classification to another requires expenditure of time and money. Individual institutions built their own classifications for record libraries—to mention only one instance, the Bellevue classification. Bellevue Hospital had changed over to the *Standard Nomenclature*, with codes for a punched-card system, long before many of its followers, using the Bellevue system, had thought of changing. When the time to change arrives, the change will be made to a classification being continuously revised and republished in convenient form.

The present edition of the *Standard Nomenclature* contains an associated code for operations. Included in the operative code are items pertaining to radiology. For example in this code

-3 Introductions
-30 Injections
-301 Air
-302 Radiopaque substance
-32 Introduction or implantation of radioactive substance
-320 Radium
-321 Radon
-322 Other radioactive substances
-323 Roentgen radiation delivered through an open wound

It would seem comparatively simple to issue a small pamphlet of terms approved by the Radiological Society for use in connection with the *Standard Nomenclature*, thus taking full advantage of the classification pertaining to anatomy and etiology.

Let me say, in conclusion, that no classification has been, is, or will be *perfect* for any one institution, to say nothing of all institutions. Furthermore, any classification is to be treated as a tool, not as a master.

ADDENDUM

Since there was no time at the meeting for general discussion, I may cover here one or two points brought out by questions directed my way.

1. It may be pointed out that the needs of radiologists are not identical with those of the clinician. The *Standard Nomenclature* deals with clinical diagnoses; the radiologist deals with shadows and their densities. True, but in the therapeutic field the clinical diagnoses apply. In the diagnostic division the radiologist may start with shadows, but he eventually meets the clinician and walks arm in arm toward a clinical diagnosis. Furthermore, the classifications published from radiological departments are concerned largely with anatomy and etiology.

2. Questions are raised as to the practicability of using certain refinements of the classification. For example, carcinoma of the endometrium, 785-887, instead of carcinoma of the body of the uterus, 782-887. The classification is for your use. If you do not make a diagnosis of carcinoma of the endometrium, then you have no use for that particular code. If you wish to record with exactness a diagnosis made by your pathologist, the nomenclature will serve you by affording the proper code. If you want to indicate exactly a primary location, followed by one showing the further extension of the carcinoma, the codes are adequate to record both diagnoses. The classification is a tool, not a dictator.

1825 W. Harrison St.
Chicago, Ill.

CASE REPORT

Meckel's Diverticulum: Preoperative Roentgen Diagnosis[1]

J. P. ROUSSEAU, M.D., and A. G. M. MARTIN, III, M.D.
Winston-Salem, N. C.

Meckel's diverticulum and its complications have been readily diagnosed for the past hundred years, but confirmation of the diagnosis has rested solely on the operative findings. It was not until 1934 that the first report of preoperative diagnosis of this condition by roentgen ray appeared. The scope of this paper is not to discuss all of the many diagnostic and symptomatic aspects of this anomaly, but to point out that roentgen demonstration of Meckel's diverticulum is still infrequent.

In a survey of the literature some 12 cases were found in which the diverticulum was recognized before operation. Pfahler's report of two cases in 1934 was the first to appear (7). His patients were examined ten and three years before he published his paper. In it he credits Case (1) with being the first to mention roentgen diagnosis of Meckel's diverticulum under the general heading "Jejuno-ileal Diverticula." Pfahler also refers to his personal correspondence with Kantor, LeWald, Hirsch, Kirklin, and Camp, none of whom had made this diagnosis, and cites Gocht's review of the roentgenological literature in 1934, which failed to include any mention of preoperative diagnosis.

Prévôt (8) reported a case in 1936, and in 1938 Foucault (4 and 5) wrote two papers on the subject, which unfortunately are not available to us. Winkelstein (10) and Skinner (9) were the first to consider the complications of the condition, Winkelstein reporting a case of peptic ulcer in the diverticulum, and Skinner a leiomyosarcoma. The next case was added by Ehrenpreis (2). The last three cases without complications that we could find were reported from Montreal by Jutras and St-Onge (6) in 1940.

Fig. 1. Four-hour film showing a pear-shaped diverticulum in the terminal ileum.

Meckel's diverticulum is the most frequent congenital anomaly found in the intestinal tract, being present in 2 per cent of adults (3). It occurs predominantly in males, the ratio being 3 males to 1 female. The site may be anywhere in the last 40 inches of the ileum.

Meckel's diverticulum is formed from the remnants of the vitello-intestinal or omphalo-mesenteric duct. While the duct normally disappears in early embryonic life, the portion nearest the small intestine may remain and develop, while the distal part undergoes degenerative changes during the fifth to seventh week of embryonic life. According to Ehrenpreis (2) the deformity may be acquired as well as congenital. The acquired type results from lowered resistance, at the attachment of the mesentery to the intestinal wall or at the point of entrance of vessels into the intestine. Diverticula containing all of the layers of the intestine are spoken of as complete, while those made up of only part of the layers are described as incomplete.

[1] From the Bowman Gray School of Medicine of Wake Forest College, Winston-Salem, N. C. Accepted for publication in December 1942.

Gastric glands are found in 12 per cent of the cases. Lieberkühn's glands and Peyer's patches may also be present.

The symptoms of Meckel's diverticulum have often been confused with appendicitis, colitis, or peptic ulcer. Colicky pain, which is severe and recurrent, is frequently found in the region of the umbilicus. This is accompanied by vomiting, which is usually persistent. The most frequent finding is bleeding from the intestinal tract, which may be in the form of melena or gross rectal hemorrhage.

The x-ray diagnosis can be made only by frequent observations of the progress of the opaque meal through the small intestine. Pfahler (7) suggested two-, three-, four-, and six-hour studies. Lateral views are important to bring out the defects pointing inward and upward toward the umbilicus, as has been emphasized by Ehrenpreis (2). The diverticulum is usually outlined as a half moon or finger-like projection arising from the ileum.

Fig. 2. Section through the diverticulum, showing all the layers of the intestine.

CASE REPORT

L. E. R., a 15-year-old girl, complained of abdominal pain, in the right lower quadrant. The past and family histories were of no significance. Development was normal, and no disease of the respiratory, cardiac, or genito-urinary system was discovered.

Four months before admission the patient suffered the first of four attacks of acute right lower quadrant pain. These attacks, which lasted about six hours, were preceded by nausea and usually followed by vomiting. They bore no relation to the ingestion of food or to bowel movements. The attack which led to hospitalization began six hours before admission. The onset of pain was acute and it was followed by nausea, without vomiting.

Physical examination showed moderate tenderness in the right lower abdominal quadrant and a slight increase in muscle tone. No rebound or referred tenderness was noted. The reflexes were physiological. A catheterized urine specimen showed specific gravity 1.020, an acid reaction, no

albumin or sugar, an occasional white blood cell. The white blood count was 10,200 (84 per cent polymorphonuclears, 16 per cent lymphocytes); the red cell count was 4,565,000; hemoglobin 91 per cent.

In spite of the apparent diagnosis of appendicitis, there was some doubt in the surgeon's mind as to the acuteness of the condition. After the acute symptoms subsided, the patient was given a barium meal. The x-ray report was as follows:

"The scout film of the abdomen is negative. The chest is negative. The gastro-intestinal study shows no evidence of ulcer, growth, or obstruction. Gastric emptying is normal.

"The progress of the meal through the small intestine at four and twenty-four hours is normal with the exception of a pouch or sac-like collection of barium seen on the four-hour film, arising from the ileum about 15 inches from the ileocecal valve. This pouch measures about 3 × 4 cm. in diameter, and could well be retained barium in a Meckel's diverticulum. [See Fig. 1.] The appendix is not visualized, and this may be interpreted as presumptive evidence of chronic disease of the appendix."

On the fifth day after admission the patient was operated upon. The appendix was removed and "the ileum was then examined and a Meckel's diverticulum was found about 15 inches from the ileocecal valve. The diverticulum was clamped transversely to the lumen of the bowel and removed with the cautery." The postoperative diagnosis was chronic appendicitis and Meckel's diverticulum.

The gross specimen consisted of the appendix and a diverticulum measuring 2.8 × 1.8 cm. The outer surface of the diverticulum was smooth and showed no evident lesion. The appendix measured 9 × 0.5 cm. The serosa was glistening and the wall without evident gross lesion. Microscopically there was no evidence of inflammatory reaction in the Meckel's diverticulum. No gastric mucosa was seen; all normal layers of the intestine were present (Fig. 2). The walls of the appendix were thickened by fibrotic tissue.

Final Diagnosis: Meckel's diverticulum; fibrosis of the appendix.

In a condition as frequent as Meckel's diverticulum, it seems highly probable that the failure to diagnose the lesion most often rests upon the radiologist. With more careful study of the small intestine, more diverticula should be found. The study of the small intestine has long been neglected because of the additional time and expense required for frequent fluoroscopic observations and the making of additional films during the interval in which the opaque meal is progressing from the stomach through the small intestine and into the cecum.

Bowman-Gray School of Medicine
Winston-Salem, N. C.

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EDITORIAL

Howard P. Doub, M.D., Editor

John D. Camp, M.D., Associate Editor

Blast Effects in Warfare

In every war new conditions arise which profoundly affect the human organism. That such effects are not limited to those participating in the actual fighting but may extend to civilians exposed to the by-products of war has become increasingly apparent. Since the beginning of the present conflict, a considerable amount of information has accumulated concerning the blast effects of high explosives on persons at some distance from the immediate scene of the explosion. While in the first World War numerous casualties occurred in which there were no external marks of violence, these seem to have received little attention in the literature. In such cases as were reported, interest centered about the lesions of the brain and spinal cord, in which petechial hemorrhages were observed.

A comprehensive discussion of blast injuries is given by Williams (4) in a recent issue of the *British Journal of Surgery*. According to him, what is known as blast is not a mere mass movement of air or other gas. It is in the nature, rather, of a pressure wave set up by the compression effect of a molecular spray acting against the inherent inertia of air or water. In general it can be said that in air the force of both the pressure and windage wave will decrease proportionately to the square of the distance from the center of the explosion. The speed of the pressure wave is high at the point of origin but rapidly falls to about that of sound.

Zuckerman (5), describing the nature of this phenomenon, states that the blast wave is a single pulse of increased pressure followed by a wave of suction. In the case of a 70-lb. bomb explosion the pressure at 14 feet is about 110 lb. per square inch, but at a distance of 50 feet this has fallen to 6 lb. per square inch. These figures represent hydrostatic pressures in excess of normal atmospheric pressure, which is about 15 lb. per square inch. In experimental studies Zuckerman found that in animals subjected to a pressure of only 5 lb. per square inch no lesions were present but at a pressure of 50 lb. small animals were sometimes killed instantaneously and at pressures approaching 100 lb. per square inch death was inevitable. He found also that animals close to the explosion were killed instantly. Those at some distance died after a lapse of time, from a minute to a day. These animals were likely to have blood-stained froth in the upper respiratory passages and suffered from dyspnea. Animals still more remote, in a zone of lower pressure, were unaffected externally, although internal examination revealed changes in the thoracic and occasionally in the abdominal organs.

The lungs are most commonly affected in blast injuries but gross trauma to the lower abdominal viscera sometimes occurs. Death is uncommon, however, in these latter cases. The ear drums, as would be expected, are frequently ruptured, and Williams mentions effects on the eye. In injury to the spinal cord and brain, severe concussion may be encountered. Abbott, Due, and Nosik (1) of the U. S. Naval Reserve have reported a small series of cases in which, as a result of the concussion effect of a nearby shell, bomb, or underwater explosion, there developed an accumulation of fluid in the subdural space—hematoma or effusion. The patients suffered from headache, minor neurologic symptoms, and intellectual impairment.

Williams calls attention to the relative infrequency of cases with internal blast injuries without external marks of violence. He has seen only 4 such cases in roughly 1,500 casualties. In practically every instance there is some co-existing wound.

The symptoms which should lead to suspicion of blast damage of the lungs are hemoptysis, pain in the chest, and cough with dyspnea. In the typical case, the patient will at first show evidence of shock and possibly nothing more for an hour or two. Later he complains of pain in the chest, with difficulty in breathing, and a distressing cough develops. The cough is at first unproductive but later there is blood-stained sputum. The pulse and respiration rates are elevated. In the early stages physical examination will reveal little. There may be some limitation of the respiratory excursion and subsequently scattered râles will be heard. Still later there may be evidence of patchy consolidation of the lungs and sometimes signs of pleural effusion.

Hadfield (2) in a series of 30 postmortem examinations on blast cases found 17 instances of multiple bilateral pulmonary hemorrhage, but with little or no significant injury to the chest wall. Deep-seated hemorrhage was frequently present in the lungs, with only slight evidence of its presence on the surface of the uncut lung. Section through the hemorrhagic area showed that the blood was present almost exclusively in the alveoli and that its source was the alveolar capillary network. A surprising disproportion existed between the amount of blood in the alveoli and the relatively slight damage to the alveolar walls. The capillaries of the walls showed invariably a generalized dilatation and congestion and this was found even in the nonhemorrhagic areas. Hadfield believes that this capillary dilatation may explain the clinical picture in those patients who survive. In some of these the hemorrhagic areas present patches of consolidation.

The chest changes are naturally of special interest to radiologists. Thomas (3) has reviewed the radiologic aspect of the pulmonary changes in a recent issue of the *British Journal of Radiology*. He calls attention to the difficulty in obtaining satisfactory roentgenograms, as the patient's condition usually requires the use of mobile apparatus. He finds that in accordance with the pathological changes which have been described the roentgen picture may vary within wide limits, from a slight loss of translucency locally to a general opacity of the lung field. In addition he believes there is a characteristic appearance of the ribs over the affected area. Posteriorly, they are close together, but anteriorly they are widely separated, indicating a condition of hyperexpansion. In a mild case described by Hadfield, the only detectable lesion was a slight loss of translucency at the left apex, together with hyperextension of the ribs. In eleven days the picture had returned to normal. This slight loss of translucency is similar to that seen in pleurisy of mild degree and may easily be mistaken for it. In cases with more extensive involvement, there may be basal changes simulating bronchopneumonia and a pulmonary consolidation may develop. Some patients have a subpleural hemorrhage, and occasionally fractured ribs area complicating factor.

With the continuance of the war and the increased use of high explosives, these blast cases may be expected to multiply. Radiologists serving in areas where men are exposed to the effects of large-caliber shells and bombs will do well to familiarize themselves with a condition which will call with increasing frequency for their skill and judgment.

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ANNUAL MEETING
RADIOLOGICAL SOCIETY OF NORTH AMERICA

Members of the Radiological Society of North America are urged to bear in mind the forthcoming meeting of the Society. According to present plans this will be held in Chicago, at the Drake Hotel, Nov. 29–Dec. 3, 1943.

In Memoriam

LOUIS LEFRAK, M.D.

1874–1943

Dr. Louis Lefrak, of New York City, died in February of this year at the age of sixty-eight. Doctor Lefrak was a native of Russia. He was a graduate of the Long Island College Hospital of Brooklyn and at one time was an instructor in the Department of Roentgenology of the New York Post-Graduate Medical School and Hospital. He was a diplomate of the American Board of Radiology and a member of the American College of Radiology and of the Radiological Society of North America.

Books Received

Books received are acknowledged under this heading, and such notice may be regarded as recognition of the courtesy of the sender. Reviews will be published in the interest of our readers and as space permits.

DISABILITY EVALUATION. PRINCIPLES OF TREATMENT OF COMPENSABLE INJURIES. By EARL D. MCBRIDE, B.S., M.D., F.A.C.S., Diplomate American Board Orthopedic Surgery; Assistant Professor in Orthopedic Surgery, University of Oklahoma School of Medicine; Attending Orthopedic Surgeon to St. Anthony's Hospital; Associate Orthopedic Surgeon to Wesley Hospital; Visiting Surgeon to W. J. Bryan School for Crippled Children; Chief of Staff to Bone and Joint Hospital, Oklahoma City, Okla. Art work by Herbert Chezam. Third Edition, revised. A volume of 631 pages with 374 illustrations. Published by J. B. Lippincott Co., Philadelphia, 1942. Price $9.00. Cloth.

ACUTE INFECTIONS OF THE MEDIASTINUM. By HAROLD NEUHOF, M.D., D.S., F.A.C.S., Clinical Professor of Surgery, Columbia University, College of Physicians and Surgeons, Surgeon to Mt. Sinai Hospital, and EDWARD E. JEMERIN, M.D., D.S., F.A.C.S., Associate Attending Surgeon Sydenham Hospital, Adjunct Surgeon Beth David Hospital, Senior Clinical Assistant in Surgery and Research Assistant, Mt. Sinai Hospital. A volume of 407 pages with 157 illustrations. Published by The Williams & Wilkins Co., Baltimore, 1943. Price $6.00.

NEUROLOGY. By ROY R. GRINKER, M.D., Chairman, The Department of Neuropsychiatry of the Michael Reese Hospital, Chicago. Third edition, revised and largely rewritten with the assistance of NORMAN A. LEVY, M.D., Associate Neuropsychiatrist Michael Reese Hospital, Chicago. With a chapter on brain tumors by PAUL C. BUCY, M.D., Professor of Neurology and Neurological Surgery, University of Illinois, College of Medicine, Chicago. A volume of 1136 pages with 416 illustrations. Published by Charles C Thomas, Springfield, Ill., 1943. Price $6.50.

CLINICAL ROENTGENOLOGY OF THE CARDIOVASCULAR SYSTEM. By HUGO ROESLER, M.D., F.A.C.P., Associate Professor of Roentgenology and Cardiologist, Department of Medicine, Temple University School of Medicine; Cardiologist, Temple University Hospital, Philadelphia, Penna. Second edition. A volume of 480 pages, with 337 figures and 2,575 references. Published by Charles C Thomas, Springfield, Ill. Price $7.50.

A MANUAL OF PULMONARY TUBERCULOSIS (Part I) and AN ATLAS OF THORACIC ROENTGENOLOGY (Part II). By DAVID O. N. LINDBERG, M.D., F.A.C.P., Lecturer on Tuberculosis, State University of Iowa, College of Medicine; Director of Roentgenology, State Sanatorium, Iowa. A volume of 219 pages, plus Index, with 189 illustrations including 145 plates. Published by Charles C Thomas, Springfield, Ill. Price $6.50.

THESE MYSTERIOUS RAYS. A NON-TECHNICAL DISCUSSION OF THE USES OF X-RAYS AND RADIUM, CHIEFLY IN MEDICINE. By ALAN L. HART, M.D. A volume of 218 pages, with 28 photographs. Published by Harper & Brothers, New York. Price $2.75.

CLINICAL SIGNIFICANCE OF THE BLOOD IN TUBERCULOSIS. By GULLI LINDH MULLER, M.D., Pathologist and Director of Laboratory, New England Hospital for Women and Children, Boston; formerly Pathologist, Rutland State Sanatorium, Rutland, Mass. A volume of 536 pages. Published by The Commonwealth Fund, New York. Price $3.50.

Book Review

OUTLINE OF ROENTGEN DIAGNOSIS. AN ORIENTATION IN THE BASIC PRINCIPLES OF DIAGNOSIS BY THE ROENTGEN METHOD. By LEO G. RIGLER, B.S., M.B., M.D., Professor of Radiology, University of Minnesota, Minneapolis, Minn. Second edition. A volume of 196 pages with 254 illustrations shown in 227 figures, presented in drawings and reproductions of roentgenograms. Figures 6 to 51 and 55 to 72 are drawings in an original technic by Jean E. Hirsch. Published by J. B. Lippincott Co., Philadelphia. Price $6.50.

This second edition of Rigler's *Outline of Diagnosis* is a revision and amplification of the original work. The text has been entirely rewritten; descriptions of newer technical procedures are added and recent knowledge aiding in the recognition of some of the more uncommon diseases is included.

The book is arranged in outline form for the use of teachers and students and makes no pretense of being all-inclusive. The material is well arranged in logical sequence and is essentially a summary of the significant facts pertaining to each of the conditions discussed. Its primary object is for teaching, but any roentgenologist will find it useful for a rapid review or an outline for lectures.

The text includes 196 pages of descriptive material and index, and there is, in addition, a pictorial atlas presenting roentgenograms, drawings, and schematic diagrams. In this atlas are included 227 illustrations with descriptive material. It is unfortunate that so many of the illustrations are drawings taken from the original roentgenograms, as these can never quite replace the reproduction of the originals. The book is well printed and adequately indexed. It can be heartily recommended for the purpose for which it was intended—namely as on outline for the teaching of roentgen diagnosis.

RADIOLOGICAL SOCIETIES OF NORTH AMERICA

Editor's Note.—Will secretaries of societies please cooperate by sending information to Howard P. Doub, M.D., Editor, Henry Ford Hospital, Detroit, Mich.

UNITED STATES

Radiological Society of North America.—Secretary, D. S. Childs, M.D., 607 Medical Arts Building, Syracuse, N. Y.

American Roentgen Ray Society.—Secretary, Harold Dabney Kerr, M.D., Iowa City, Iowa.

American College of Radiology.—Secretary, Mac F. Cahal, 540 N. Michigan Ave., Chicago, Ill.

Section on Radiology, American Medical Association—Secretary, J. T. Murphy, M.D., 421 Michigan St., Toledo, Ohio.

ARKANSAS

Arkansas Radiological Society.—Secretary-Treasurer, J. S. Wilson, M.D., Monticello. Meets every three months and annually at meeting of State Medical Society.

CALIFORNIA

California Medical Association, Section on Radiology.—Secretary, Joseph D. Coate, M.D., 434 Thirtieth St., Oakland.

Los Angeles County Medical Association, Radiological Section.—Secretary, Donald R. Laing, M.D., 65 N. Madison Ave., Pasadena. Meets second Wednesday of each month at County Society Building.

Pacific Roentgen Society.—Secretary-Treasurer, L. Henry Garland, M.D., 450 Sutter St., San Francisco. Society meets annually during annual meeting of the California Medical Association.

San Francisco Radiological Society.—Secretary, Earl R. Miller, M.D., University of California Hospital. Meets monthly on third Thursday at 7:45 P.M., for the first six months at Toland Hall (University of California Medical School); second six months at Lane Hall (Stanford University School of Medicine).

COLORADO

Denver Radiological Club.—Secretary, Edward J. Meister, M.D., 366 Metropolitan Bldg. Meetings third Friday of each month at the Denver Athletic Club.

CONNECTICUT

Connecticut State Medical Society, Section on Radiology.—Secretary-Treasurer, Max Climan, M.D., 242 Trumbull St., Hartford. Meetings bimonthly, on second Thursday. Place of meeting selected by Secretary.

FLORIDA

Florida Radiological Society.—Acting Secretary, Walter A. Weed, M.D., 204 Exchange Building, Orlando.

GEORGIA

Georgia Radiological Society.—Secretary-Treasurer, James J. Clark, M.D., 478 Peachtree St., N. E., Atlanta. Meetings twice annually, in November and at the annual meeting of State Medical Association.

ILLINOIS

Chicago Roentgen Society.—Secretary, Warren W. Furey, M.D., 6844 S. Oglesby Ave. Meets at the Palmer House, second Thursday of October, November, January, February, March, and April.

Illinois Radiological Society.—Secretary-Treasurer, William DeHollander, M.D., St. Johns' Hospital, Springfield. Meetings quarterly by announcement.

Illinois State Medical Society, Section on Radiology.—Secretary, Fay H. Squire, M.D., 1753 W. Congress St., Chicago.

INDIANA

The Indiana Roentgen Society.—Secretary-Treasurer, Harold C. Ochsner, M.D., Methodist Hospital, Indianapolis. Annual meeting in May.

IOWA

The Iowa X-ray Club.—Holds luncheon and business meeting during annual session of Iowa State Medical Society.

KENTUCKY

Kentucky Radiological Society.—Secretary-Treasurer, Sydney E. Johnson, M.D., Louisville City Hospital, Louisville. Meeting annually in Louisville, third Saturday afternoon in April.

LOUISIANA

Louisiana Radiological Society.—Secretary-Treasurer, Johnson R. Anderson, M.D., North Louisiana Sanitarium, Shreveport. Meets annually at same time as State Medical Society.

Shreveport Radiological Club.—Secretary-Treasurer, R. W. Cooper, 940 Margaret Place. Meetings monthly on the second Wednesday, at the offices of the various members.

MARYLAND

Baltimore City Medical Society, Radiological Section.—Secretary, Walter L. Kilby, M.D., 101 W. Read St. Meetings are held the third Tuesday of each month.

MICHIGAN

Detroit X-ray and Radium Society.—Secretary-Treasurer, E. R. Witwer, M.D., Harper Hospital, Detroit. Meetings first Thursday of each month from October to May, inclusive, at Wayne County Medical Society club rooms, 4421 Woodward Ave., Detroit.

Michigan Association of Roentgenologists.—Secretary-Treasurer, E. M. Shebesta, M.D., 1429 David Whitney Bldg., Detroit. Meetings quarterly by announcement.

MINNESOTA

Minnesota Radiological Society.—Secretary, John P. Medelman, M.D., 572 Lowry Medical Arts Bldg., St. Paul. Meetings quarterly.

MISSOURI

Radiological Society of Greater Kansas City.—Secretary, Arthur B. Smith, M.D., 306 E. 12th St., Kansas City, Mo. Meetings last Thursday of each month.

The St. Louis Society of Radiologists.—Secretary, Paul C. Schnoebelen, M.D., 462 N. Taylor Ave. Meets on fourth Wednesday of each month except June, July, August, and September, at a place designated by the president.

NEBRASKA

Nebraska Radiological Society.—Secretary, F. L. Simonds, M.D., 1216 Medical Arts Bldg., Omaha. Meetings third Wednesday of each month at 6 P.M. in either Omaha or Lincoln.

NEW ENGLAND

New England Roentgen Ray Society (Maine, New Hampshire, Vermont, Massachusetts, and Rhode Island).—*Secretary,* Hugh F. Hare, M.D., Lahey Clinic, Boston, Mass. Meets monthly on third Friday at Boston Medical Library.

NEW JERSEY

Radiological Society of New Jersey.—Secretary, H. J. Perlberg, M.D., Trust Co. of New Jersey Bldg., Jersey City. Meetings at Atlantic City at time of State Medical Society and midwinter in Newark as called by president.

NEW YORK

Associated Radiologists of New York, Inc.—Secretary, William J. Francis, M.D., 210 Fifth Ave., New York City. Regular meetings the first Monday evening of the month in March, May, October, and December.

Brooklyn Roentgen Ray Society.—Secretary-Treasurer, Leo Harrington, M.D., 880 Ocean Ave. Meetings held the fourth Tuesday of every month, October to April.

Buffalo Radiological Society.—Secretary-Treasurer, Joseph S. Gianfranceschi, M.D., 610 Niagara St. Meetings second Monday evening each month, October to May, inclusive.

Central New York Roentgen Ray Society.—Secretary-Treasurer, Carlton F. Potter, M.D., 425 Waverly Ave., Syracuse. Meetings are held in January, May, and October, as called by Executive Committee.

Long Island Radiological Society.—Secretary, Marcus Wiener, M.D., 1430 48th St., Brooklyn. Meetings fourth Thursday evening each month at Kings County Medical Bldg.

New York Roentgen Society.—Secretary, Maurice Pomeranz, M.D., 1120 Park Ave., New York, N. Y.

Rochester Roentgen-ray Society.—Secretary, S. C. Davidson, M.D., 277 Alexander St. Meetings at convenience of committee.

NORTH CAROLINA

Radiological Society of North Carolina.—Secretary-Treasurer, Major I. Fleming, M.D., 404 Falls Road, Rocky Mount. Meeting with State meeting in May, and meeting in October.

NORTH DAKOTA

North Dakota Radiological Society.—Secretary, L. A. Nash, M.D., St. John's Hospital, Fargo. Meetings by announcement.

OHIO

Ohio Radiological Society.—Secretary, J. E. McCarthy, M.D., 707 Race St., Cincinnati. The next meeting will be held at the time and place of the annual meeting of the Ohio State Medical Association.

Cleveland Radiological Society.—Secretary-Treasurer, J. O. Newton, M.D., 13921 Terrace Road, East Cleveland. Meetings at 6:30 P.M. at the Mid-day Club, in the Union Commerce Bldg., on fourth Monday of each month from October to April, inclusive.

Radiological Society of the Academy of Medicine (Cincinnati Roentgenologists).—*Secretary-Treasurer,* Samuel Brown, M.D., 707 Race St. Meetings held third Tuesday of each month.

PENNSYLVANIA

Pennsylvania Radiological Society.—Secretary-Treasurer, L. E. Wurster, M.D., 416 Pine St., Williamsport. The Society meets annually.

The Philadelphia Roentgen Ray Society.—Secretary, Robert P. Barden, M.D., 3400 Spruce St., Philadelphia. Meetings held first Thursday of each month at 8:15 P.M., from October to May, in Thomson Hall, College of Physicians, 21 S. 22nd St., Philadelphia.

The Pittsburgh Roentgen Society.—Secretary-Treasurer, Reuben G. Alley, M.D., 4800 Friendship Ave., Pittsburgh, Pa. Meetings are held on the second Wednesday of each month at 4:30 P.M., from October to June, at the Pittsburgh Academy of Medicine, 322 N. Craig St.

ROCKY MOUNTAIN STATES

Rocky Mountain Radiological Society (North Dakota, South Dakota, Nebraska, Kansas, Texas, Wyoming, Montana, Colorado, Idaho, Utah, New Mexico).—*Secretary,* A. M. Popma, M.D., 220 North First St., Boise, Idaho.

SOUTH CAROLINA

South Carolina X-ray Society.—Secretary-Treasurer, Robert B. Taft, M.D., 103 Rutledge Ave., Charleston. Meeting in Charleston on first Thursday in November, also at time and place of South Carolina State Medical Association.

TENNESSEE

Memphis Roentgen Club.—Chairmanship rotates monthly in alphabetical order. Meetings second Tuesday of each month at University Center.

Tennessee Radiological Society.—Secretary-Treasurer, J. Marsh Frère, M.D., 707 Walnut St., Chattanooga. Meeting annually with State Medical Society in April.

TEXAS

Texas Radiological Society.—Secretary-Treasurer, Herman Klapproth M.D., Sherman.

VIRGINIA

Virginia Radiological Society.—Secretary E. Latané Flanagan, M.D., 215 Medical Arts Bldg., Richmond.

WASHINGTON

Washington State Radiological Society.—Secretary-Treasurer, Kenneth J. Holtz, M.D., American Bank Bldg., Seattle. Meetings fourth Monday of each month at College Club, Seattle.

WISCONSIN

Milwaukee Roentgen Ray Society.—Secretary-Treasurer, C. A. H. Fortier, M.D., 231 W. Wisconsin Ave., Milwaukee. Meets monthly on second Monday at the University Club.

Radiological Section of the Wisconsin State Medical Society.—Secretary, Russell F. Wilson, M.D., Beloit Municipal Hospital, Beloit. Two-day annual meeting in May and one day in connection with annual meeting of State Medical Society, in September.

University of Wisconsin Radiological Conference.—Secretary, E. A. Pohle, M.D., 1300 University Ave., Madison, Wis. Meets every Thursday from 4 to 5 P.M., Room 301, Service Memorial Institute.

CANADA

Canadian Association of Radiologists.—Honorary Secretary-Treasurer, A. D. Irvine, M.D., 540 Tegler Bldg., Edmonton, Alberta.

La Société Canadienne-Française d'Eléctrologie et de Radiologie Médicales.—General Secretary, Origène Dufresne, M.D., Institut du Radium, Montreal. Meetings are held the third Saturday of each month, generally at the Radium Institute, 4120 East Ontario Street, Montreal; sometimes, at homes of members.

CUBA

Sociedad de Radiología y Fisioterapia de Cuba.—Offices in Hospital Mercedes, Havana. Meetings are held monthly.

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THE HEAD AND NECK

Experiences with Encephalography in Cerebellar Tumor. W. J. Gardner and W. A. Nosik. Am. J. Roentgenol. **47:** 691–698, May 1942.

While ventriculography is the procedure of choice for the demonstration of a clinically suspected posterior fossa tumor, the authors found on a survey of records for the past ten years that in 24 cases encephalography had been inadvertently employed. On the basis of these cases they describe the encephalographic findings. The most striking of these is the presence of air over the mesial surfaces of the cerebral hemispheres, outlining the supracallosal and cingulate sulci. The supracallosal fossa is more rounded and closer to the cranial vault than in the normal picture, due to the upward bulging of the corpus callosum from the obstructive hydrocephalus beneath. Other characteristic features are the presence of a cerebellar hernia, apparent on the films as a filling defect in the triangular portion of the cisterna magna which lies just below the foramen magnum, and a flattening of the pontine cisterns. The films gave no indication of the exact location of the lesion in the posterior fossa and no hint as to its possible anatomic structure. Air entered the ventricles in only 4 cases.

Only 3 patients showed any immediate deleterious effects from the encephalographic procedure. One of these died and his death is attributed to encephalography. The other 2 recovered and lived one and three years, respectively.

Numerous encephalograms are reproduced.

Tumors of the Acoustic Nerve from a Roentgenological Viewpoint. C. W. Schwartz. Am. J. Roentgenol. **47:** 703–710, May 1942.

The author prefaces his discussion of the roentgen features of acoustic nerve tumors by a discussion of the nomenclature and a description of the general diagnostic and differential features. The tumors are of most frequent occurrence in the third decade. They grow slowly, involve the eighth nerve first, produce atrophy in and about the internal auditory meatus, and when bilateral are apt to be associated with neurofibromatosis; when large, they invade the cerebellopontile angle and give rise to increased intracranial pressure.

A complete roentgen examination should include stereoscopic films of both sides of the head and films taken in the occipital, semilateral (Stenvers), nose-chin (Waters), and brow-nose positions, these last with the tube centered between the occiput and vertex and tilted caudad about 5 degrees in order that the shadow of the petrous pyramids may be cast behind the orbits. Planigraphy is useful to show the internal auditory meatuses.

The earliest roentgen evidence of an acoustic nerve tumor is slight atrophy of the walls of the auditory canal, as evidenced by demineralization of the cortex, to be determined by comparison with normal areas of bone on the same or opposite side. The next step in the development of the tumor may be recognized by enlargement of the internal auditory meatus with atrophy of its walls. This is followed by emergence of the tumor from the canal and the production of a notch-like defect in the petrous ridge, usually as part of the destructive enlargement of the internal auditory meatus As the tumor continues to develop, an encephalogram may show a distortion, obliteration, or even a cystic enlargement of the homolateral portion of the cisterna ambiens, and also a distortion of the aqueduct. There may also be sufficient transmitted pressure to produce a slight homolateral atrophy of the dorsum sellae, particularly if this structure happens to be of the type most susceptible to atrophy. In the last stages of development there is added to the changes previously mentioned the evidence of increased intracranial pressure. The pineal gland may be displaced by an acoustic nerve tumor, but such a displacement is much more commonly found in association with a supratentorial tumor.

While the changes listed above are typical, they are not present in all acoustic nerve tumors. Not infrequently a tumor is found which produces little or no bony change until the stage of increased intracranial pressure is reached. In such a case a relatively early diagnosis would have to depend upon the symptoms and clinical findings plus encephalography, which would be expected to show the usual distortions of the cerebral fluid spaces produced by a tumor in the cerebellopontile angle.

Among the conditions to be considered in the differential diagnosis are cancer, primary epidermoidoma of a petrous pyramid, meningioma originating from the walls of the petrosal sinuses, and glioma of the astrocytic or oligodendral type.

Two pages of references are included.

THE CHEST

X-Ray Diagnosis of Thoracic Suppuration in Children. F. Y. Durrance. Texas State J. Med. **38:** 324–326, September 1942.

This paper deals with suppurative lesions occurring within the lungs, pleural spaces, and mediastinum of infants and children. Those within the lungs may be divided into two main classes: simple abscess and gangrene, both having as a common basis an inflammatory reaction leading to necrosis of the parenchyma. In abscess, the necrosis is localized, less extensive, and of slow development, while in gangrene, necrosis is rapid, producing multiple large areas of lung destruction with numerous irregular cavities.

Pulmonary abscess may arise as a result of infection within the lung; it may be embolic in origin, or may represent an extension of a mediastinal or, rarely, a subdiaphragmatic lesion.

Abscesses of pulmonic origin are usually single. In the early stages, the roentgen appearance is that of a dense consolidation within the lung, varying in size and surrounding the area of infection, usually starting near the hilus, progressing slowly toward the periphery of the lung. This picture may be equally suggestive of lobar or acute hilum pneumonia but reexamination after twenty-four to forty-eight hours will make differentiation possible. In acute hilum pneumonia there will be no change in size or extent of the consolidation; in acute lobar pneumonia a pronounced change will be observed, with complete lobar involvement; in abscess there will be progressive peripheral extension of consolidation only. The surrounding zone of inflammatory consolidation tends

to disappear very rapidly following the evacuation of the abscess. Where drainage is unsatisfactory, a chronic abscess develops. The chronicity of abscesses may be recognized on the roentgenogram by a much less marked zone of inflammation surrounding the cavity; the walls are smooth with general rounded outline, filling readily with halogenated oil on bronchography, whereas the acute cavity can rarely be made to fill. The duration of abscess and its stage of chronicity should be carefully determined, since any pulmonary abscess which lasts three months without definite healing will probably not heal without surgical aid, although some do disappear spontaneously after many months. As long as there is roentgenographic evidence of any remnant of infection, there is danger of spread by the respiratory system to involve other portions of the lungs.

Abscesses of metabolic origin usually begin at the periphery of the lung and are frequently multiple. Those of contact origin are single.

Suppuration occurring within the pleural spaces originates from a serous effusion becoming infected, from rupture of a pulmonary or mediastinal abscess into the pleural space, or from pre-existing pneumonia. The initial sign on the x-ray film is a ribbon-shaped band of increased density within the involved pleural space due to a fibrinoplastic exudate filling this space. Any part of the pleural cavity may be involved, frequently producing quite obscure shadows on chest films unless the course of the rays is so directed as to record these spaces. At first, this narrow dense band extends from apex to base, then either rapidly encases the lung, giving a homogeneous opacity to this side of the thorax with little or no alteration of mediastinal structures, or it becomes encapsulated between the visceral and parietal pleura or along the interlobar fissures to produce a fusiform opacity conforming to that portion of pleural space involved. Deeply seated empyemas may present a confusing picture and contrast studies with iodized oil may be necessary to determine the form, location, and extent of the lesions.

Mediastinal suppuration may result from extension from infections of the nose and throat, the spine, the lungs, or the retroperitoneal area, or may be a part of a generalized infection. Prior to the development of a cavity, abscess of the superior mediastinum has to be differentiated from adenopathy of the tracheobronchial glands. The semicircular, sharp circumscription of borders with anterior displacement of the trachea usually suffices for this determination. An abscess of the inferior mediastinum must be differentiated from empyema of the mesial portion of the pleural cavity. The abscesses are usually rounded, and the empyemas more fusiform in shape, with adjacent thickening of pleura and less extension into the mediastinal space.

Pulmonary Tuberculosis: The Adelaide Health Survey. D. R. W. Cowan. M. J. Australia **2:** 353–357, Oct. 17, 1942.

X-ray Health Survey Conducted by The Adelaide Board of Health with a Report on the First 10,048 Attendances. H. K. Fry. M. J. Australia **2:** 357–360, Oct. 17, 1942.

These two articles discuss the advantages and disadvantages of a so-called Health Survey and give the data acquired in over ten thousand x-ray chest examinations.

The Australian and New Zealand Association of Radiologists thought the plan was valueless, according to Cowan. His discussion is lengthy but resolves itself into the question of whether or not the radiologist is capable of making a diagnosis of tuberculosis from the x-ray film. He states that radiography is by no means a reliable method of demonstrating the fact that a person has been infected with the tubercle bacillus; it can only reveal evidence of changes in the lung due to the disease. It cannot, with any degree of certainty, say what is the nature of the lesion or whether or not it is active. The radiologist should not be expected to assume the role of principal actor in the diagnosis of this disease.

In the chest clinic, Cowan says, more patients are seen with a chronic cough associated with sinus infection than with active tuberculosis. In such cases there are no abnormal findings whatsoever in the lungs, but it is the history that suggests a correct diagnosis.

In conclusion Cowan objects particularly to mass surveys of school children as being of no value. He suggests that, if such surveys are to be made, they include those twenty years of age or over.

Fry reports some of the results of the Adelaide Survey, which was started by a voluntary group. Three physicians, two of them radiologists, comprised the "viewing committee." After three thousand examinations the Local Board of Health took over.

Over ten thousand persons were examined, 35 mm. film being used: 4,618 were males and 5,480 were females. The age range varied from infancy to ninety years, with the largest number ranging from fifteen to twenty years of age.

The outstanding result of the survey was the demonstration of a high proportion of elderly males showing radiographic evidence of advanced pulmonary tuberculosis. These men usually consider themselves in good health, or believe that they are merely suffering from catarrh or bronchitis, and have no knowledge of the necessity of effective precautions.

DONALD R. LAING, M.D.

Tuberculosis in London in Wartime. W. A. Daley and B. Benjamin. Brit. M. J. **2:** 417–420, Oct. 10, 1942.

This article is an interesting collection of statistics which analyzes the state of affairs as regards pulmonary tuberculosis in London and the British Isles generally during the last four years. The subject is attacked from the standpoint of increase in cases of tuberculosis in various age groups, changes in mortality and types of tuberculosis manifested, sex incidence, and possible etiological factors.

Some of the figures are impressive. For example, as compared with 1938, 1941 showed an increase of 43 per cent in new cases of pulmonary tuberculosis and 15 per cent of non-pulmonary tuberculosis. The death rate also shows a decided increase. The rise in incidence has affected children more than adults, particularly the increase in tuberculosis of non-pulmonary types. In the age group above 25 males have been more in evidence than females. The increase in pulmonary tuberculosis among adults is more apparent in London, probably from droplet infection due to crowding in bomb shelters and similar environments. Pasteurization of milk has held the incidence of bovine tuberculosis to a minimum. Q. B. CORAY, M.D.

Functional Performance of Extrapleural Pneumothorax. M. Arnold. Schweiz. med. Wchnschr. **72:** 1144–1149, Oct. 17, 1942.

It has been pointed out that the best control measure in tuberculosis is pneumothorax, but any collapse method which will give a similar or better collapse is equally satisfactory. Such a procedure is extrapleural pneumothorax, especially where a bilateral collapse is contemplated. The following requirements are listed:

1. Overcorrection at the operation.
2. Control of pain in preserving the rib cage; preservation of the intercostal vessels.
3. Early control of the cough in the postoperative period.
4. Little or no elevation of pressure during refills.
5. Puncture of the sero-hematoma at not too early a date, and under strict aseptic precautions.
6. Removal of infected serum and local instillation of "cibazol solution" (irrigations only in frank empyema).
7. Daily needling of hematoma from the start, till free fluid flow and complete emptying are possible. No pressure elevation is permissible.
8. Filling of the dry cavity to a final pressure of +32 to +34.

If these points are observed, the extrapleural pneumothorax, like the intrapleural, will end in healing and avoid such sequelae as residual cavity, permanent collapse, and cosmetic deformity.

As the basis for his report the author takes his first 50 cases in which this operation was performed. Three groups are distinguished. The first (active, progressive, exudative-cavernous, febrile tuberculosis) contained 19 patients. One died; 2 remained sputum-positive; 16 are able to work. The second group (relatively inactive, non-progressive, partly exudative and partly productive, cavernous, subfebrile cases) contained 29 patients. Three died and in 2 the pneumothorax closed spontaneously. Of the 26 living, 4 remain sputum-positive and cannot work. The third group (inactive, non-progressive, cirrhotic, cavernous, afebrile tuberculosis) contained only 2 cases, both now sputum-negative.

The author concludes that this procedure is a valuable therapeutic approach, especially because the collapse can be better localized and because bilateral collapse is practical. The remaining lower lung is undisturbed and no thoracic deformity is present to prevent its maximum aeration.

LEWIS G. JACOBS, M.D.

An Influenza-Like Epidemic with Confluent Lung Infiltrate (Virus Pneumonia) in an Infantry Battalion. E. Haemig and W. Heyden. Schweiz. med. Wchnschr. **72:** 1113–1119, Oct. 10, 1942.

In an influenza epidemic appearing in February 1942, and involving 105 men, 59 had a roentgenologically demonstrable lung infiltrate. The disease began acutely with headache, dry cough, high intermittent fever, profuse sweating, but no dyspnea. A characteristic feature was the discrepancy between the slight auscultatory signs—or their complete absence—and the roentgenologic findings. The infiltrates appeared as delicate, small, round or fan-shaped extensions out from an enlarged hilus. Absorption occurred one to three weeks after lysis of the fever, which was not affected by chemotherapy. The scanty sputum showed a mixed flora. At the onset the leukocyte count was normal or leukopenic with a shift to the left. Later it rose, often as high as 15,000. The sedimentation rate was inconstant, generally but little elevated. The disease followed a benign course, only 4 patients showing complications. In 3 a solid pneumonic infiltrate developed, with effusions in 2; in 1 case apparent toxic damage to the capillaries led to a muscular hematoma.

Although it was impossible to isolate the responsible organism, the symptoms and character of the lung infiltrate were suggestive of the atypical pneumonia described by Smiley and others, a virus pneumonia.

LEWIS G. JACOBS, M.D.

Silent Bronchopneumonia. Paul M. Andrus. Canad. M. A. J. **47:** 339–344, October 1942.

This is a discussion of 96 cases of pneumonia-like lesions, inflammatory and exudative in character, which might not have been detected without radiographic examination incident to military service. These are termed silent, concealed, or undiagnosed bronchopneumonias.

The patients were not considered ill, but a history of recent "cold" or "flu" was obtained in a majority of cases. Respiratory lag of the affected side was usual. The blood sedimentation rate and leukocyte count were elevated in most instances. Radiographic shadows disappeared and the sedimentation rate became normal in one to five weeks.

Fifty-four per cent of the lesions occurred on the right side of the thorax; 76 per cent were below the level of the third costal cartilage, 8 per cent above the second costal cartilage, and the remaining 16 per cent in the mid-zone between these levels. The shadow usually occurred within a cone-shaped segment with the apex toward the hilus, and lesions were generally localized masses rather than of patchy distribution. Their duration was generally shorter than in clinically manifest bronchopneumonias; however, since many were not discovered until the latter stages of the disease this is not to be regarded as a positive finding. The seasonal incidence was the same as in parallel cases of clinically manifest disease.

In 38 per cent of the cases some residual abnormal pulmonary or pleural marking remained after resolution, and the author points out that bronchiectasis and bronchiectasis-like disease may result from silent, undiagnosed bronchopneumonia just as from clinically manifest bronchopneumonia. Twelve case histories are presented to illustrate the nature of incidents by which such lesions came to light.

A summary is made of previous reports of obscure and transient pulmonary lesions which are designated by various names, such as atypical bronchopneumonia, virus pneumonia, pneumonitis, etc., and it is shown that unless evidence of a different anatomical or etiological pattern of acute pulmonary exudation is demonstrated, all visible transient lesions are best regarded as regional or bronchopneumonia. Some have regarded these silent bronchopneumonias as the result of low virulence of the causative organism. It is suggested here that, since a majority of patients admitted a previous respiratory infection, it is possible that so-called "silent" bronchopneumonias are merely cases in which the diagnosis is first made in the post-toxic

stage, but before the completion of resolution of exudate.

The subject of undiagnosed bronchopneumonia is important because (1) it may be considered that the disease occurs with more or less regularity in civilian population; (2) in the absence of radiography it is safest to regard and manage all cases of intercurrent respiratory disease as possible bronchopneumonias; (3) in most cases of bronchiectasis there is a history of acute pneumonia but in one-third to one-half the cases there is no such history and it is possible that the silent bronchopneumonia which may leave visible post-resolution damage is the missing link.

M. L. CONNELLY, M.D.

Pneumoconiosis in the Talc Industry. F. W. Porro, J. R. Patton, and A. A. Hobbs, Jr. Am. J. Roentgenol. **47:** 507–524, April 1942.

The authors report a study of the dust hazards of talc mining and milling as seen in two talc-producing companies in New York State. The dust present contains about equal amounts of the two silicates, tremolite and soapstone, with no free silica. Except for asbestos, the silicates have received only slight attention as a possible occupational hazard.

Fifteen cases are reported in some detail, 5 with autopsy findings. Of the 5 workers who came to autopsy, 4 had experienced some exposure to dust other than talc, but it was in all instances considerably less than the talc exposure. In one case autopsy showed an associated tuberculosis of considerable extent, and in 2 others slight evidence of tuberculosis. Of the remaining 10 cases, all showed roentgenographic changes considered to be due to pneumoconiosis (talc). In only 2 of these had there been exposure to dust other than talc. Three were considered to have associated infection.

The chief symptoms were dyspnea, cough, chest pain, and weakness, dyspnea being the first and most distressing symptom. Cyanosis and clubbed fingers occurred. In all cases vital capacity was very low. The gross pulmonary changes consisted in stiffening of the lungs, with nodules in the parenchyma and moderate enlargement of tracheobronchial lymph nodes. Microscopically, there were irregular bands of cellular fibrosis surrounding the vessels and bronchi; histiocytes and fibroblasts were numerous, with occasional foreign-body giant cells. Asbestosis bodies were found in all cases.

Diffuse haziness was the most consistent roentgenographic abnormality, and is considered the earliest detectable change. When nodulation occurs, the nodules are less dense and less well defined than those of typical silicosis. Nodules are variable in size and tend to become confluent. After the onset of symptoms disability appears to be irrecoverable; hence it is desirable to withdraw the worker from exposure before symptoms occur. HOBART H. WRIGHT, M.D.

Bagassosis: An Industrial Lung Disease. L. I. M. Castleden, and J. L. Hamilton-Paterson. Brit. M. J. **2:** 478–480, Oct. 24, 1942.

This article is a very interesting presentation of the preliminary findings in what appears to be a new acute chest infection, the etiology of which is closely related to various types of pneumoconiosis.

Bagasse is the name applied to broken sugarcane which remains after the extraction of the sugar. This material is used for making insulating board, apparently quite like the celotex commonly used in the United States. The method of its handling is discussed and the history of the appearance of cases incidental to its use is touched upon. In most cases of bagassosis the patient becomes acutely ill with a respiratory complaint and the x-ray film of the chest has the appearance of bilateral bronchial pneumonia or influenza. After an acute course of several weeks the symptoms subside and a process of resolution takes place, during which the film becomes more or less cleared.

Conclusions reached by the author as to the nature of this disease are as follows: (1) It may be a form of silicosis which follows an allergic phase during resolution. (2) It may be a lung response to crystalline cellulose. (3) It may be a chronic fibrosis resulting from pulmonary edema with secondary allergic processes.

Attempts to produce the disease in experimental animals have failed. Q. B. CORAY, M.D.

Pneumonic Heart Injuries. O. Spühler. Schweiz. med. Wchnschr. **72:** 1099–1102, Oct. 3, 1942.

Cardiac injury during the course of pneumonia shows certain characteristics. Most patients with this disease show some signs which can be ascribed to cardiac injury. For the most part they are of a reversible nature without sequelae, and consist of inflammatory parenchymatous myocardial changes. It is often possible to demonstrate them electrocardiographically, and sometimes radiographically (cardiac dilatation). In addition to these slight changes there can occur severe irreparable damage with persisting conduction delay, bundle block, and cardiac dilatation. Pericarditic and endocarditic inflammatory changes are not rare. In one of the cases reported severe inflammatory muscular degeneration with chronic valvular endocarditis resulted.

LEWIS G. JACOBS, M.D.

Critical Analysis of Standard Methods of Estimating Heart Size from Roentgen Measurements. W. J. Comeau and P. D. White. Am. J. Roentgenol. **47:** 665–676, May 1942.

This study is based upon orthodiascopic observations on 200 normal hearts in persons ranging in age from 15 to 70 years—150 males and 50 females.

The transverse diameter of the heart was found to lie between 9.5 and 13.9 cm. in 93 per cent of those examined, and in only 8 per cent was the measurement greater than 13.4 cm. In 90 per cent the frontal cardiac area was between 80 and 119 sq. cm. and in a similar percentage the heart volume was between 350 and 700 c.c. All of these measurements showed lower limits in women than in men. Of the three measurements the authors consider the transverse diameter the most satisfactory from a clinical standpoint.

The cardiothoracic ratio was also determined, but the authors regard this as an unreliable method of estimating cardiac enlargement, unworthy of the general reliance which has been placed upon it.

They consider the best approach to the problem of determining whether or not the heart is enlarged in an individual case to be by the use of prediction tables, based on body measurements, and refer to the nomograms by Kurtz (Orthodiascopy, New York, Mac-

millan Co., 1937) constructed on the standards established by Hodges and Eyster. The predicted transverse diameter they found to be a more satisfactory standard than the predicted frontal cardiac area. On the former basis 80 per cent of their normal group were included between a ±10 per cent deviation, with only 6 per cent exceeding a +10 per cent deviation.

The authors add a warning that, while cardiac mensuration is a valuable method, it is not infallible in determining the presence or absence of enlargement. Heart measurements must be interpreted with judgment and with the realization that exceptions to the established limits exist. Of particular importance in evaluating these measurements is the appreciation of the importance of body build and the position of the heart in the thorax. Rather large measurements may indicate a relatively small heart for individuals of a certain habitus whereas similar or even smaller measurements may signify considerable cardiac enlargement in individuals of a different body build. This factor is too often overlooked in the routine roentgenological examination of the heart.

THE DIGESTIVE TRACT

Gastric and Duodenal Ulcers in South Australia. J. B. Cleland. M. J. Australia **2:** 295–299, Sept. 26, 1942.

A study of 5,070 autopsies done over a period of twenty-two years showed that the number of gastric ulcer cases numbered 110 as compared to 70 duodenal ulcers. Gastric and duodenal ulcers were equal in number up to fifty years of age, but beyond that the gastric ulcers increased considerably. Gastric ulcers were found more often in males by a ratio of four to one, and duodenal ulcers were predominant in the male by a ratio of seven to one. About half of the gastric ulcers were fatal. Hemorrhage was the cause of death in 23 cases; the immediate effects of rupture were responsible for another 20 deaths; 6 patients died following operations upon the stomach, and the remaining 6 from miscellaneous causes.

A review of 2,500 autopsies was made to determine the diagnostic acumen in these cases. Twenty-two gastric ulcers were diagnosed or suspected out of a total of 34, and 19 duodenal ulcers were diagnosed or suspected out of a total of 26.

DONALD R. LAING, M.D.

Further Contributions to the Causation and Treatment of Duodenal Ulcer and Its Complications. T. H. Somervell. Brit. J. Surg. **30:** 113–125, October 1942.

This article, from a mission hospital in Travancore, is based on a large number of duodenal ulcers in natives of southern India, where the disease is of common occurrence; 4,000 operations for duodenal ulcer were performed in the hospital in the course of the last twenty years. Medical treatment was, in general, out of the question, since the poverty of the majority of the patients and their elementary state of civilization rendered adequate dieting impossible.

The diet in South India is definitely deficient in vitamins A and B, more especially so in the regions where ulcer is prevalent, and to this deficiency must be attributed an etiologic role. The overwhelming preponderance of carbohydrate in the diet is no doubt a contributory cause.

The diagnosis was based on x-ray findings and observations following a fractional test meal. In almost every case a persistent deformity of the duodenal cap proved at operation to be an ulcer. The results of the test meal determined the type of operative procedure. The author divides his ulcer cases into several categories on the basis of the test meal curve: (1) the high-acid type, which is treated by gastro-enterostomy and ligature of the gastric arteries; (2) moderately high-acid type I, treated by ligature of the arteries, though a simple gastro-enterostomy may suffice to reduce the acidity after an interval of months; (3) moderately high-acid type II, with high acidity rising slowly after the meal is taken, also treated by ligature of vessels; (4) slightly high-acid or high normal type, suitable for gastro-enterostomy alone.

The author calls arterial ligature physiological gastrectomy. In order to obtain good results 4 out of every 5 arteries must be tied. Early reduction in acidity occurs in most cases, although after a year or more the results are identical with those of gastro-enterostomy alone. The author never performs gastrectomy for uncomplicated duodenal ulcer.

Gastrojejunal ulcer occurred as a sequel to operation in 28 of the author's cases. Medical treatment is not recommended in these cases but in a few instances apparent cures were obtained. The majority of the cases were treated surgically. MAX CLIMAN, M.D.

THE BILIARY TRACT

Internal Biliary Fistulae. W. B. Taylor. Canad. M. A. J. **47:** 332–336, October 1942.

Fistulous communications between the gallbladder or bile ducts and an adjacent viscus are relatively rare. Such a fistula may be the result of a foreign body lodged in the biliary system or it may be secondary to a liver abscess or hydatid cyst. The most common etiologic factor, however, is the presence of gallstones. There are two types of stones: (1) the metabolic, which are almost pure cholesterol, are usually single, and attain a large size; (2) infective stones, always multiple and facetted. Ulceration of the gallbladder wall is more commonly due to metabolic stones. The stone remains in the gallbladder or biliary duct system, where it produces erosion due to pressure; an irritative response is set up in overlying peritoneum, which becomes adherent to the peritoneum of the adjacent organ; the gallstone is expelled into the gastro-intestinal tract, leaving a fistulous communication behind.

Immediate dangers associated with internal biliary fistula formation are hemorrhage, due to erosion of a blood vessel, and intestinal obstruction by the gallstone.

Of 153 cases reported by Judd and Burden (Ann. Surg. **81:** 305, 1925) the largest percentage occurred in the sixtieth year of life and the average duration of symptoms was ten years. In some of this series the symptoms pointed toward a peptic ulcer. Only 32 were not associated with gallstone.

The author reports 6 cases of internal biliary fistula. The only cases in which the presence of the fistula was established prior to operation or necropsy were diagnosed roentgenographically, with the aid of the barium meal. In a recent review, Garland and Brown

(Radiology **38:** 154, 1942) found 90 instances of roentgen diagnosis. In one of Taylor's 6 cases a constant finding was the presence of gas in the gallbladder and hepatic ducts. M. L. CONNELLY, M.D.

THE SKELETAL SYSTEM

Morquio's Disease Associated with Mental Defect. M. J. Farrell, J. D. Maloney, and P. I. Yakovlev. Arch. Neurol. & Psychiat. **48:** 456–464, September 1942.

Two cases of the bizarre familial osteochondrodystrophic dwarfism originally described by Morquio in 1929 are added to the 43 cases already in the literature. A Syrian girl, aged 19 years, and her brother, aged 14 years, are reported as showing all of the most characteristic signs described by Morquio with one notable exception, *viz.*, normal intelligence. In contradistinction to all previous reports, both patients had definite mental insufficiency, a feature which in the past has been considered an important diagnostic point in distinguishing Morquio's disease from the closely allied condition of gargoylism (Hurler's syndrome). None of the other characteristic signs of gargoylism, such as cloudy corneas, hepatomegaly, splenomegaly, large misshaped head, and hypertelorism, was present in either of these two cases.

A brief review of the literature and a short discussion of possible etiological factors are included.

DEPARTMENT OF ROENTGENOLOGY,
UNIVERSITY OF MICHIGAN (J. H.)

Localized Fibrocystic Disease of Bone. Results of Treatment in 152 Cases. R. H. Alldredge. J. Bone & Joint Surg. **24:** 795–804, October 1942.

This review of 152 cases of localized fibrocystic disease of bone compares the various types of treatment and their results. Spontaneous healing, without treatment, is not known to occur.

When resection of the cyst is done, the result is excellent. This is best adapted to non-weight-bearing bones, as the fibula or a rib. Resection with massive bone transplant has also given excellent results, but is often difficult.

Simple curettage was done in 36 cases. In 7 of these the results were excellent. In 3 additional cases the results were almost as good. In others results were fair but additional treatment was required in some. Curettage with chemical cauterization showed no improvement over curettage alone. There seems to be little choice between curettage and bone chips, and curettage and massive graft. Either of these methods gives better results than curettage alone.

In 15 patients irradiation alone was the method of treatment. In 6 cases the results were definitely poor. Some patients sustained fractures, and in one case malignant change occurred ten years after treatment. In 6 instances good results followed the treatment. Pain is always relieved by irradiation.

Eight irradiated patients were subsequently treated by surgery. In only one case, where resection was done, was the result excellent. The failures were attributed to the irradiation. One patient received 13 treatments at monthly intervals in 1919. In 1923 the lesion was curetted and showed no evidence of new growth. In 1935 spindle-cell osteogenic sarcoma was found.

Preoperative irradiation was given in one case but the result could not be classed as excellent because a very small cavity remained. Postoperative irradiation was followed by no better results than operation alone.

This article seems to place radiotherapy on the defensive, without adequate description of the amount or type of radiation given. It is questionable if all the patients received adequate irradiation, nor is it clear whether they were unsuitable for surgery and therefore irradiated. JOHN B. MCANENY, M.D.

Case of Osteitis Fibrosa Cystica with Parathyroid Tumor. C. A. Royde. Brit. J. Surg. **30:** 169–175, October 1942.

An unusual case is reported, in a woman, age 53 years, who had symptoms for three years before coming under observation and treatment. She had tender tumors of both clavicles; kyphoscoliosis of the upper dorsal spine; obliquity of the pelvis; a large tumor in the center of the shaft of the left femur, with gross deformity of the thigh; marked deformity of both tibiae; distortion of the upper end of the right ulna and the middle phalanx of the left middle finger. The left side of the thyroid gland appeared to be larger than the right.

Roentgen examination revealed gross generalized decalcification of every bone in the body, widespread cystic changes, and a healed pathological fracture of the left humerus. The body of the fifth thoracic vertebra was collapsed and all the vertebrae were markedly decalcified.

The blood chemistry was within normal limits except for a gross increase of plasma phosphatase, while the urinary excretion of calcium was definitely below normal. The calcium had obviously been "washed out" of the bones over a period of at least three years.

At operation a parathyroid tumor was found behind the left lobe of the thyroid. The tumor extended downward into the left mediastinum, from which it was easily delivered and removed intact. Death occurred from a cerebral thrombosis.

In the discussion the author quotes Albright's theory of the existence of primary and secondary hyperparathyroidism (J. A. M. A. **117:** 527, Aug. 16, 1941). If there is a negative calcium balance, bone disease will develop. Hyperparathyroidism causes a change in the blood chemistry with increased excretion of calcium in the urine, which increases the chance of the patient being in a state of negative calcium balance. If enough calcium is ingested, however, the calcium balance does not become negative and bone disease does not develop. Severe hyperparathyroidism may exist without any clinical, roentgen, or histologic evidence of bone disease.

In secondary hyperparathyroidism more parathormone is being produced than normal. In rickets and osteomalacia there is a low serum-calcium which causes a hyperfunction and hypertrophy of the parathyroids. In severe kidney disease with retention of non-protein-nitrogen there may be a high serum phosphatase and low serum calcium. This will stimulate the parathyroids and result in osteitis fibrosa cystica. In any case of osteitis fibrosa cystica, it is important to know whether the disease is primary or secondary, for in the latter event it will obviously be harmful to remove parathyroid tissue. Kidney function should be fully determined in any case of osteitis fibrosa cystica.

MAX CLIMAN, M.D.

Primary Genetic Dysplasia of the Hip with and without Classical Dislocation. V. L. Hart. J. Bone & Joint Surg. **24:** 753–771, October 1942.

Dysplasia of the hip, also known as "dysplastic acetabulum," "hip dysplasia without dislocation," "preluxation," "potential dislocation," "inadequate acetabulum," "incomplete acetabulum," "flat socket," and "subluxation," is the genetic bone defect preceding classical congenital hip dislocation, although dislocation need not actually take place. The primary defect is not limited to the acetabulum but involves all the mesodermal structures of the hip joint. Primary dysplasia without dislocation but with varying degrees of subluxation is a distinct entity.

The hereditary feature of this congenital defect is a primary hip and acetabular dysplasia, not dislocation. In some families few of the members show dislocation but many manifest hip dysplasia without dislocation. The sex ratio for the total number of dysplasias approaches the universal average, but there is a preponderance of dysplasias with dislocation among females, the ratio being six to one. This preponderance is due to the sex-conditioned structure of the pelvis, which in the female has a more perpendicular innominate bone and a shallower acetabulum.

The primary anatomical and roentgenographic feature of hip dysplasia is abnormal acclivity of the roof of the acetabulum, which increases the angle of incidence of the roof of the socket. The acetabular index is the angle formed by the roof or iliac portion of the acetabulum and a horizontal line passing through the Y or triradiate cartilages. Normally in a child the index is 20 degrees. When it exceeds 30 degrees dysplasia exists. The flatness of the inadequate and incompetent acetabulum can further be proved through the increase in the radius of curvature where the centrum of the sector which the acetabulum presents on the roentgenogram goes off laterally, instead of lying, as it normally does, somewhere in the middle of the femoral head.

Other features to be noted in these abnormal pelves are: hypoplasia of the pelvis; hypoplasia of the head and central diaphyseal end of the femur (before puberty); delayed appearance and hypoplasia of the capital epiphyseal ossification center; disturbance of Shenton's line; delayed bony bridging of the ischiopubic synchondrosis; increased distance of metaphysis from acetabular floor; elevation of metaphysis; classical dislocation of opposite hip. Arthrography shows the position of the limbus cartilage and relation of the acetabulum to the femoral head.

Primary hip dysplasia must be differentiated at times from coxa plana, epiphyseal separation, tuberculosis, infectious arthritis, hypertrophic arthritis, aseptic necrosis, late septic hip, neoplasm, neurotropic lesions, old fracture-dislocations, and endocrine dysfunction. Symptoms in childhood may be extremely difficult to differentiate from Legg-Perthes' disease.

If classical dislocation does not occur, the acetabulum may return to normal (rarely), or the dysplastic hip may remain flat, with incongruity and instability.

Treatment in infancy consists in application of an abduction splint as in true dislocation. In later years the patient should have his activity restricted and overweight should be prevented. Conservative measures should be tried first. A shelf operation may improve the condition but will not correct the incongruity.

JOHN B. MCANENY, M D.

Arthroplasty for Congenital Dislocation of the Hip. A Late Follow-Up Report. P. C. Colonna. J. Bone & Joint Surg. **24:** 812–826, October 1942.

Following an unfortunate experience in operative reduction of a congenital dislocation of the hip in a child, the author devised a two-stage procedure that has been quite successful. It is advocated (1) in those under three years of age in whom closed reduction has not been successful and (2) in those over three but under ten years of age. This is a report of the late results of the procedure.

Roentgenograms of the congenitally dislocated hip show the faulty acetabulum and abnormal position. The femoral head is displaced upward and posteriorly from the poorly formed acetabulum, and the capsule assumes an hour-glass shape. The isthmus may be of variable length and diameter, and is usually thickened superiorly over the femoral head, where the weight is borne. The pelvitrochanteric group of muscles and the large vessels and nerves become contracted. Lordosis and lurch are present as the result of the displacement of the head of the femur.

The first stage of the author's procedure consists of measures to stretch the soft tissue structures sufficiently to allow the femoral head to descend to the level of the acetabulum. The adductors are tenotomized. The second stage is operative and consists in deepening the acetabular fossa so that it will adequately accommodate the femoral head. The result is correction of the backward and upward displacement of the head and consequently of the lordosis and lurch. Shortening is eliminated; stability and mobility are secured.

Five patients have been followed for from six and a half to nine years. The results are satisfactory. The depth of the acetabulum remains good or improves; the acetabular roof increases in density; fusion of the acetabular floor is hastened; aseptic necrosis of the femoral head has not occurred, even though the ligamentum teres is always severed in the procedure; the joint space is not diminished; the capital epiphysis develops normally; redislocation has not occurred and the hip is stable; very little post-traumatic arthritis has been noticed.

Serial films of several cases are reproduced, showing the changes that occur. Detailed case reports are also included.

JOHN B. MCANENY, M.D.

Calcification and Ossification of the Menisci. J. B. Weaver. J. Bone & Joint Surg. **24:** 873–882, October 1942.

Two cases of calcification of the menisci are here added to the 76 already in the literature. Two types are recognized; primary, without known cause, and secondary, due to trauma. The primary type occurs in older, the secondary in younger persons. Males predominate in both types. Both knees are affected in the primary type and usually only one in the secondary.

A lateral roentgenogram shows a wedge-shaped shadow, while in the opposite view the outline is wafer-like. Hypertrophic arthritic changes are usually present in the primary type.

Treatment is symptomatic, and sometimes surgical.

One case of ossification of the meniscus is reported. It differs little in any respect from secondary calcification and the treatment is the same.

JOHN B. MCANENY, M.D.

Acute Osteomyelitis of the Patella. Case Report. H. T. Kirby-Smith. J. Bone & Joint Surg. **24:** 942–944, October 1942.

Only 60 cases of acute osteomyelitis of the patella have previously been reported. The author adds one to this number.

A seven-year-old boy had an infection of the right ankle and a week later the left knee became swollen and painful. Two weeks later the patellar region was swollen and incision yielded pus. Roentgenograms at this time showed a moth-eaten fragmented patella, which was later removed. Two months later the wound was completely healed. A year later, regeneration of the patella is taking place. Function at the knee is practically normal.

JOHN B. MCANENY, M.D.

Sprains and Subluxations of the Ankle Joint. J. R. Hughes. Proc. Roy. Soc. Med. **35:** 765–766, October 1942.

The author suggests that in radiography the ankle joint be held in full inversion. By this method, a definite tilt of the astragalus, especially in cases of rupture of the calcaneo-fibular (lateral) ligament, can be ascertained. This tilt is not seen on routine anterior-posterior views.

The 57 cases considered here are broken up into three groups: Group I showing a tilt of 5° or less, Group II, 5 to 10°, and Group III a tilt of more than 10°. The last is evidently due to a complete rupture of the middle fasciculus of the external lateral ligament. The other two groups represent partial tears of the anterior fasciculus, found in most sprains. Group III cases consequently require rigid immobilization, and frequently operative interference to repair the ligamentous structures. STEPHEN N. TAGER, M.D.

Intercalary Bones of the Intervertebral Disc. E. Lyon. J. Bone & Joint Surg. **24:** 805–811, October 1942.

Intercalary bones are small ossifications situated between the vertebrae, usually on the anterior aspect and most commonly in the lumbar but at times also in the cervical and thoracic spine. Along the lateral margins they may be situated between two opposite spondylotic osteophytes but anteriorly they are seen as homogeneous triangular shadows between the edges of two vertebrae. Characteristically, there is a clear space between the vertebrae and the intercalary bone. The presence of these formations is characteristic of spondylosis.

The intercalary bone is believed to be formed as a result of injury to the anterior portion of the annulus fibrosus, or even protrusion of a part of the nucleus pulposus through the fibers of the annulus fibrosus, followed by calcification and later ossification of this tissue. The formation of this bone and the production of spondylosis is possible only if the annulus fibrosus is separated from the epiphysis of the vertebral body. The intercalary bone is considered as a harmless, rare, and accessory finding in the rather frequently occurring condition of spondylosis.

This bone represents the ultimate stage of a curative process in a lesion which has occurred a considerable time previously.

Intercalary bones must be differentiated from calcification and ossification of the nucleus pulposus. In juveniles there is a calcification of the intervertebral disc that occurs with infectious diseases but is later absorbed. There is little difficulty in distinguishing the triangular bony shadow that may appear on the anterior superior edge of a lumbar body produced by intrusion of the tissue of the intervertebral disc into the vertebra. A separated spondylotic osteophyte is the only one entity most likely to be confused with an intercalary bone. JOHN B. MCANENY, M.D.

Rhizomelic Spondylosis. Orthopaedic and Roentgen Therapy. L. D. Baker. J. Bone & Joint Surg. **24:** 827–830, October 1942.

This is a preliminary description of the apparatus and routine used in the treatment of 22 cases of rhizomelic spondylosis. Irradiation is used to relieve pain and muscle spasm.

The patient receives a complete examination and any focal infection is removed. Complete blood studies are made. Roentgen therapy is given to the entire spine or possibly to only part. "Two hundred kilovolts is used in treating areas of about 5 by 15 centimeters. One hundred and fifty roentgen units are given over one or more areas daily for three to five treatments; if necessary the dosage is repeated after three to six weeks." Blood transfusions and other supportive measures are used when indicated.

The orthopedic treatment consists in placing the patient in a bed with a fracture board hinged so that the normal kyphosis of the spine is maintained. Physiotherapy and corrective exercises are carried out daily. In place of the usually advised plaster cast for the body, a special brace has been constructed for warm climate use.

The results of this treatment have been quite satisfactory. Irradiation relieves the pain and spasm, permitting earlier application of the remainder of the treatment. Hospital stay has been reduced from a matter of weeks to about ten days. The blood sedimentation rate approaches normal. Occasionally the roentgen therapy is repeated for recurrent pain.

Sufficient time has not as yet elapsed to determine the end-results completely, but the immediate results are encouraging. JOHN B. MCANENY, M.D.

Spondylolisthesis. Report of Three Cases in Adults with Forward Displacement of the Vertebra Below the Level of the Laminar Defect. S. Kleinberg and M. S. Burman. J. Bone & Joint Surg. **24:** 899–906, October 1942.

This is a report of several cases of spondylolisthesis. The first showed bilateral defects in the lamina of the second lumbar vertebra with anterior displacement of the third body in reference to the second lumbar body. In the second case there were also bilateral laminar defects in the second lumbar vertebra and a defect in the right lamina of the third lumbar vertebra with anterior displacement on the fourth and rotation. The third patient showed a left laminar defect of the twelfth thoracic vertebra extending into the left articular process. The first lumbar vertebra was displaced anteriorly and to the right and associated with rotation of the first and second lumbar vertebrae to the right. JOHN B. MCANENY, M.D.

Pelvic Dislocations. R. G. Taylor. Brit. J. Surg. **30:** 126–132, October 1942.

The normal degree of movement at the symphysis pubis is 0.5 mm. in the male and 1.5 mm. in the female.

Any separation in excess of this must be regarded either as a subluxation or a dislocation. The separation may occur transversely or vertically. Dislocations of any degree of severity are associated with subluxation of the sacro-iliac joint posteriorly. The ilium may be displaced upward on the sacrum or hinged medially or laterally on the sacrum. The symphysis pubis may be subluxated in the sagittal or coronal plane and dislocation may occur in 3 directions. (1) The articulating surfaces may overlap each other in the mid-line. (2) The dislocation may occur in a vertical direction. (3) The articulating surfaces of the dislocated side may be displaced laterally from the sound side and in addition may be displaced upward, on the same level, or inferiorly. In this series of 22 cases the articulating surfaces of the sacro-iliac joint and the symphysis pubis were displaced only on one side. There was no instance of injury to the pelvic viscera in the entire series.

These dislocations are produced by either hyperextension or hyperabduction of the lower limb on the trunk. All of the cases in this series were the result of indirect violence. Manipulative treatment is preferable to surgery. The author has had the best results with the pelvic sling method of Sir Astley Cooper. Good results are also obtained with the lateral postural method of Watson-Jones. There were 3 deaths in the present series. The patients who recovered were able to walk well within a period of four months, with the exception of 2 who also sustained fractures of the femur. MAX CLIMAN, M.D.

Metrazol Complications as Affected by the Use of Curare. J. A. Cummins. Canad. M. A. J. **47:** 326–329, October 1942.

The author discusses the use of metrazol in a series of psychogenic psychoses in which no pathological changes in the body were demonstrable and no toxic factors had been found. Since September 1938, 365 such cases had been treated in the Ontario Hospital, Hamilton, Ontario. Of this group 240 were out of the hospital at the time of the report and others had spent a total of 210 months on probation.

The most serious complication of metrazol therapy is heart failure, but as only patients with normal cardiovascular systems were treated, this was not observed in the present series. The second most serious complication is fracture, the chief problem being presented by compression fractures of the bodies of the thoracic vertebrae, usually the fifth to the seventh, where there is a natural kyphosis. These factors are the result of strong convulsive contractions of the extensor back muscles alternating with the flexor muscles of the trunk, bringing great stress on these vertebrae. One hundred and twenty-five cases were treated before this complication was known. In the next 122 cases films were made before and after treatment and changes in the thoracic vertebrae were shown in 18 patients. One patient with compression fractures of the sixth and seventh thoracic vertebrae with a suggestion of injury to the fifth has now resumed his occupation of farm laborer and has no complaints relative to the back injury. There were two patients with moderate compression fractures (of the fifth thoracic), but neither suffered any disability relative to the injury. The remaining 15 patients simply showed lipping and thickening of the bones at the articular surfaces.

Since 1940 curare has been used to supplement metrazol therapy in 118 cases, and in this group only four compression fractures of the vertebrae—all of slight extent—have occurred. The incidence has thus been reduced from 14.8 to 3.4 per cent. Curare acts at the neuromuscular junction by interrupting nervous impulse; administered intravenously, it paralyzes the skeletal muscles first and intercostal and diaphragmatic muscles last. The margin between a treatment dose and a dose that will cause paralysis of the respiratory muscles is small. No evidence was found to suggest that curare detracts in any way from the therapeutic effect of metrazol.

M. L. CONNELLY, M.D.

Etiology of Aseptic Necrosis of the Head of the Femur after Transcervical Fracture. E. L. Compere and G. Wallace. J. Bone & Joint Surg. **24:** 831–841, October 1942.

Aseptic necrosis of the femoral head following fracture of the neck is quite common and has been the subject of much investigation. The primary etiological factor is disruption of the blood supply.

To determine the influence of accurate and immediate reduction with fixation upon this complication, a group of dogs was so treated. In another group the fractures were inaccurately reduced but with firm fixation, while a third group received no fixation. The incidence of necrosis was lowest in the group with immediate and accurate fixation; without fixation, necrosis of the head occurred frequently; it was observed frequently, also, with inaccurate fixation, but less often than when no fixation was used.

JOHN B. MCANENY, M.D.

Metastatic Neuroblastoma in Bone. S. G. Aitken. New Zealand M. J. **41:** 209–212, October 1942.

The author presents a case of bone tumor of the right tibia in which the clinical features and biopsy led to a diagnosis of Ewing's tumor, changed postmortem to adrenal neuroblastoma. The patient was a girl 16 years of age with the usual symptomatology —*i.e.*, dull intermittent pain accompanied by some swelling. The x-ray impression was that of Ewing's tumor. Local irradiation was instituted, 3,264 r being administered with no amelioration. Following development of cranial symptoms—vomiting, photophobia, and drowsiness—a craniotomy was performed and an extradural mass was found. This also was diagnosed as Ewing's tumor. Further radiation (2,000 r) to the skull was given without success Two months after admission, the patient died. Postmortem examination showed a large, ill defined retroperitoneal mass at the level of the first lumbar vertebra extending upward into the posterior mediastinum. The adrenal glands as such were unrecognizable. Microscopic examination showed rosettes having the appearance of neuroblastoma. This conformed closely to the original appearance of the skull tumor, which was probably secondary.

The author points out that Ewing's tumor must be of rare occurrence and believes that this diagnosis should not be accepted in most cases without a gross and histologic postmortem examination. He refers to Colville and Willis' findings in a similar case (Am. J. Path. **9:** 421, 1933) and quotes Ewing himself to the effect that "metastatic adrenal tumors present much the same structure as endothelioma of bone."

STEPHEN N. TAGER, M.D.

RADIOTHERAPY

NEOPLASTIC GROWTH

Treatment of Carcinoma of the Cervix with Interstitial Radiation. R. W. Teahan, H. Wammock, and J. Weatherwax. J. A. M. A. **120:** 423–426, Oct. 10, 1942.

The problem in the treatment of cervical cancer is essentially one of delivering lethal amounts of radiation to the outermost parts of the diseased areas. The method most frequently used in applying radium has been that in which it is placed in the uterine canal and in the vagina against the cervix. For the great majority of patients in whom one or both broad ligaments have become involved, the central portion of the disease may be destroyed, but actively growing cells at the periphery receive inadequate irradiation.

The patient should have a rather complete physical examination and biopsy to the end that the extent of the disease will be known as accurately as possible. In most instances a cystoscopic examination is indicated; in some, a proctoscopic examination, while a lesser number require other x-ray diagnostic studies. An initial blood count should be made. Roentgen treatment is given with the following factors: 200 kv., 50 cm. skin-target distance, Thoraeus filter, half value layer 1.7 mm. copper. A dose of 200 r is given daily to two anterior and three posterior ports, each field being 10 × 15 cm. and anterior and posterior ports being alternated. Treatment is continued until the skin shows definite irradiation effects. The anterior ports generally receive 2,000 to 2,400 r and the posterior ports about 1,800 to 2,000 r.

After the roentgen treatment has been completed, four weeks are allowed to elapse before radium is used. The application is made under a general anesthetic, with the patient in the lithotomy position. The abdomen is opened and the abdominal contents are explored. Any enlarged nodes are excised and adhesions are separated. Both tubes and ovaries are removed. A bimanual examination of the uterus is then made. This aids in determining the extent of the involvement and in planning the distribution of the radium.

Generally nine or ten 1-mg. radium element needles are placed at the periphery of the cervix parallel to the cervical canal and approximately 1 cm. apart. These are filtered by 0.5 mm. of platinum, are 21 mm. long, and have an active length of 15 mm. Two to four 2-mg. needles are placed in each broad ligament, beginning at the periphery of the cervix and extending outward and backward to the pelvic wall.

The proximal ends of these needles are placed about 1 cm. apart. Each is threaded with fine monel metal wire to facilitate its removal. A rubber tube with a wall thickness of 2 mm., containing two to four radium tubes in tandem, is placed in the cervical and uterine canal in such a manner that the highest tube contains 13.33 mg. of radium while the remainder contain 6.66 mg. of radium. Filtration of the tubes is 1.5 mm. platinum. Gauze containing sulfanilamide crystals is packed into the vagina in such a manner that the bladder and rectum are pushed as far as possible away from the radium. The radium is left in position for approximately two hundred and sixty hours. The authors estimate that the amount of radiation reaching the pelvic wall at least equals that estimated by Paterson and Parker as being necessary to kill cancer cells.

Of the 52 patients with carcinoma of the cervix who were treated by the authors, several had very extensive disease. The primary healing of the cervix has been remarkably good. Little sloughing has been encountered and then only in the stage 4 cancers. No permanent damage to the bladder or rectum has been noted, although several patients experienced a temporary proctitis. No ureteral injuries have been recognized. Some of the abdominal incisions have been slow in healing.

Of this series of patients, 23 are dead, 15 having died within one year of treatment and 7 between one and two years after treatment. One lived three years. Twenty-nine are still living. One is alive and well for more than eight years. The authors use the method described in all stage 2 and stage 3 and in some stage 4 cancers.

A chart is given showing the distribution of gamma roentgens concentric to tubes and needles.

CLARENCE E. WEAVER, M.D.

Two Types of Urological Complications Occurring in Patients Treated for Cancer of the Cervix. B. L. Hayllar. Urol. & Cutan. Rev. **46:** 617–619, October 1942.

The author has observed two types of urinary complications in patients treated for carcinoma of the cervix: (1) ureteral stricture with resultant hydronephrosis; (2) ulceration of the bladder. These complications are found in patients with an arrested primary lesion.

Three cases of ureteral stricture are presented, 2 occurring ten years and the other four years after treatment. The author believes that these strictures are not due to irradiation, inasmuch as they are unilateral, and both ureters receive an equal amount of radiation. The stricture occurs 4–6 cm. above the ureteral-vesical orifice. That is in the portion of the ureter which passes through the broad ligament. Microscopic examination of the distal third of the ureter reveals a peri-ureteral infiltration of tumor cells which is probably a result of lymphatic invasion of carcinoma cells with resultant fibrosis.

Two cases of post-irradiation bladder ulceration are reported. This complication occurred six to twelve months after radiation therapy. The ulcerations occurred in the posterior third of the bladder base, a point anatomically nearest the site of irradiation.

The author is of the opinion that the number of five-year cures may be increased by urological treatment of the complications.

MAURICE D. SACHS, M.D.

Discussion on Treatment of Inoperable Carcinoma of Rectum. W. B. Gabriel *et al.* Proc. Roy. Soc. Med. **35:** 767–772, October 1942.

This discussion was opened by *Mr. W. B. Gabriel*, who classified "inoperable" rectal carcinoma in four groups, as follows:

1. Locally operable and suitable for radical operation. Senility, active pulmonary tuberculosis, severe degrees of renal or cardiac failure, and severe diabetes with complications prevent surgical procedure here.

2. Locally operable but with liver metastasis. These cases are usually discovered on abdominal exploration. Such patients should not be subjected to the dangers and pain of a radical operation, when there is no hope of cure by surgery.

3. Locally borderline or inoperable without clinical evidence of metastases. Palpable extrarectal induration laterally and anteriorly is of serious import. If nodules of growth can be felt high up in the posterior fornix the growth is certainly inoperable. With regard to the upper third of the rectum, one must refuse to label advanced or borderline cases as inoperable until they have been proved to be so by laparotomy.

4. Locally borderline or inoperable with evidence of abdominal metastases, such as palpable deposits in the liver, secondary intraperitoneal masses, ascites, or jaundice.

Mr. Ralph Phillips continued the discussion with special emphasis on radiotherapy. He makes it clear that the advanced cancer cannot be cured. In such cases radiation is given only for limited objectives—to stop hemorrhage, to lessen discharge, and to relieve pain. Pain due to involvement of spinal nerves is better treated by other methods.

Phillip's series of inoperable cases numbered 65, of which 22 were recurrences and were given radiotherapy (million-volt x-rays) only in hope of palliation. In most recurrent cases growth is widespread, and there is often sepsis and perineal sinus formation as well. Thirty-two cases were inoperable because of the extent of the primary growth but showed no clinical evidence of metastases. In 14 of these cases, disappearance of the carcinoma followed million-volt irradiation, supplemented in three instances by other measures (intrarectal radium application in one, surgical diathermy in one, and perineal excision in a third). Nine of this group were alive at the time of the report but only one more than four years. Four patients were inoperable because of liver metastases but nothing is said of these beyond the fact that arrest of the primary growth was obtained in 2. Finally there were 7 cases in which the rectal growth was operable, but the general condition of the patient precluded surgery. In 6 of these, carcinoma disappeared after x-ray treatment. Five were still well after two years.

Summarizing these results, Phillips says that of 65 surgically rejected carcinomata of the rectum, 19 disappeared after treatment by million-volt x-rays, or roughly a third of the total. Nothing like this had been seen with 200-kv. x-rays. The improved result with the higher voltage is attributed in part to the gain in depth-dosage, *i.e.*, of the order of 40 per cent for small fields, and the better distribution of the dose, which is uniformly high in the malignant tissue.

Several procedures proposed for relief of the intractable pain, apart from palliative colostomy, were discussed by *Mr. A. Dickson Wright.* Chordotomy he had found to be most satisfactory of all, but this is reserved for younger subjects with good reserves of strength.

Dr. Ffrangcon Roberts expressed the opinion that x-ray treatment can improve the condition sufficiently to make a colostomy unnecessary, a large dose being given through multiple small fields [technic not stated]. Three of his 25 patients were living after five years.

Dr. Phillip Flood suggested making the tumor accessible by surgical exposure and then subjecting it to contact irradiation. This has the advantage of giving a very large dose, restricted entirely to the tumor. It is especially adaptable for cases considered inoperable on account of their fixation.

Others discussed the surgical aspects of this important problem. STEPHEN N. TAGER, M.D.

Radiation Treatment of Cerebellar Medulloblastoma: Report of 31 Cases. E. P. Pendergrass, P. J. Hodes, and E. W. Godfrey. Am. J. Roentgenol. **48:** 476–489, October 1942.

Generally patients with cerebellar medulloblastoma reveal roentgen evidence of increased intracranial pressure. Early, the dorsum sellae may look slightly ragged or thin. In more advanced cases the posterior clinoid processes disappear and the dorsum becomes narrow and pointed. The anterior clinoid processes may be affected in the same manner. The floor of the hypophyseal fossa shares slightly or not at all in the bone atrophy. Frequently there is convolutional atrophy. Sutures in young persons may become separated. Ventriculography must be employed for accurate information as to the tumor site.

The authors have never treated suspected medulloblastoma with irradiation alone. They favor the use of irradiation after decompression. They consider this procedure less hazardous; it avoids wasted effort and the embarrassment of irradiating the entire cerebrospinal axis in patients whose lesion proves to be a tumor simulating a cerebellar medulloblastoma.

The present surgical treatment of medulloblastoma is limited to a decompression by removal of the rim of the foramen magnum and atlas, and biopsy of the tumor. The head is irradiated four to six weeks after the operation, through five portals, three cerebellar and two cerebral. Two suboccipital portals are centered over each cerebellar lobe and are directed through the cerebellum into the vermis and fourth ventricle. The third cerebellar portal lies over the posterior one-third of the top of the head, directed caudad into the posterior fossa. Target-skin distance is 50 cm. The therapeutic objective is to deliver approximately 2,000 r to each of the five skin areas. The spine is divided into two or three rectangular fields each wide enough to cover the lateral margins of the vertebral bodies. Each portal receives 2,000 roentgens. Dosage, especially over the cerebellum, is small at first and is increased as tolerated. The chances for a sudden cerebral catastrophe are greatest during the first few days of irradiation. The entire course of treatment is usually completed in one month. The entire therapeutic course is repeated in four to six months.

In analyzing results there appears to be a highly significant difference between the mean survival period of the patients who received a primary tumor dose of less than 3,000 r compared with the patients who received a primary tumor dose of more than 3,000 r.

Before the advent of radiotherapy the average postoperative duration of life in patients with medulloblastoma varied from six to twelve months. Recently, however, with the adoption of radiation therapy, these figures have improved considerably, approaching a two- to three-year survival period in selected, thor-

oughly treated series. In the authors' experience these patients have lived an average of about twenty-eight months following operations. Four patients are still alive, fifteen, nineteen, thirty, and forty months, but, whereas postoperative irradiation has succeeded in prolonging life, it has not succeeded in effecting cures.

CLARENCE E. WEAVER, M.D.

Roentgen Therapy of Pituitary Adenomas. H. D. Kerr and W. K. Cooper. Am. J. Roentgenol. **48:** 467–474, October 1942.

The chromophobe type of intrasellar tumor produces signs and symptoms due only to its compression of adjacent secreting glandular tissue and to pressure upon neighboring structures, notably the optic chiasm and hypothalamus. There is first a defect in the superior temporal quadrants of the visual fields, and with additional pressure complete bitemporal hemianopsia results. There is finally a total loss of vision. The chromophile adenoma produces hypersecretion of the anterior lobe hormone. The appearance of this tumor before closure of the epiphyses results in the so-called pituitary giant, while acromegaly occurs if the tumor appears after the epiphyseal closure. Visual disturbances are not so common but may occur. In the "mixed" adenoma there may be signs of both chromophobe and chromophilic adenoma in the same patient. Pituitary adenocarcinoma is a true malignant neoplasm with outstanding manifestations, such as trigeminal involvement and ocular palsies. It rarely metastasizes.

Headache is a common complaint in the presence of hypophyseal neoplasms. Basophilic adenomas rarely attain large size and chromophilic tumors frequently fail to become sufficiently large to produce enlargement of the sella. Chromophobe adenomas, on the other hand, frequently produce sellar changes, with the sella showing enlargement by depression of its floor, destruction of the posterior clinoid processes, and erosion of the anterior clinoid processes. Roentgen evidence of increased intracranial pressure rarely results from the presence of intrasellar tumors.

In a ten-year period the authors have seen 41 pituitary tumors: 75.6 per cent were of the chromophobe type, 21.9 per cent were chromophile, and 2.4 per cent were basophile. The patients were about evenly divided as to sex; 35 per cent were in the age group 51 to 70; 45 per cent were from 31 to 50, 15 per cent from 21 to 30, and 5 per cent from 1 to 11. Twenty-five cases treated by roentgen rays and followed for over one year, or until death, are reported. In 14 of these 25 cases, or 56 per cent, the results are considered to be excellent, in 5, or 20 per cent, good, and in 6, or 24 per cent, poor.

Contrary to adverse reports in the literature, the authors' experience indicates that chromophobe tumors respond well to irradiation. They attribute this to the relatively heavy doses they have employed. All but one of the cases were treated with 200 kv., with filtration of either 0.5 mm. copper or Thoraeus filter, at 50 cm. distance. Each of two portals is given 200 r daily as measured in air, with the exception that only one area is treated the first day. This is done to minimize brain reaction. If none occurs, treatment is continued as outlined. In most cases therapy was carried out through five portals—one to each temporal, frontal, vertical, and occipital region. Each receives 1 800 r, a total of 9,000 r, measured in air. This treatment causes temporary epilation, but in the authors' experience this has never become permanent.

The chief criteria used in judging progression or regression of the disease are the visual field changes and loss of headache. This study indicates that irradiation is the treatment of choice and that this should be carried out with relatively heavy doses. If, however, the patient shows evidence of progression of the disease in a period of three to four months, surgical exploration should be done because of the likelihood that the tumor is cystic. A warning is given against using relatively large doses of radiation in patients with arteriosclerosis associated with hypertension.

CLARENCE E WEAVER, M.D.

Value of the Roentgen Therapeutic Test Dose in Differential Diagnosis of Mediastinal Tumors. L. Reynolds and T. Leucutia. Am. J. Roentgenol. **48:** 440–465, October 1942.

Since the roentgen therapeutic test dose as employed in the diagnosis of mediastinal tumors represents in most instances the maximum amount of radiation that can safely be administered, its exact measurement is of the utmost importance. The aim must be to deliver to the tumor area the entire radiation within the shortest possible time. Irreparable pulmonary fibrosis follows protracted irradiation over the lungs. In the average case it has been found that 130 per cent S.U.D. represents the uppermost limit of a therapeutic test dose which may be safely administered. [The authors include a footnote stating that 100 per cent S.U.D. represents 900 r (525 r in air) given in one seance on a 20 × 20-cm. field, with an intensity of 20 r per minute, if the quality of the rays is that obtained with 200 kv. equiv. (1 mm. Cu); and 1,100 r (800 r in air) if the quality is that obtained with 500 kv. equiv. (7 mm. Cu).] This is given by cross-firing the tumor through several portals according to the individual requirements. The size of portals should be reduced as the tumor decreases in size if a prot.acted fractionated irradiation series is given. Since 1932 supervoltage roentgen rays obtained with 500 kv. and 7 mm. Cu forefilter have been preferably used. This permits a more efficient cross-firing of the tumor with less risk of injury to the normal structures.

On the basis of the irradiation response, mediastinal tumors can be placed, for all practical purposes, in four rather arbitrary groups.

Group I includes tumors originating from the proliferation of the highly radiosensitive lymphocytic cell element, such as lymphocytoma, mediastinal manifestations of aleukemic leukemia, pseudoleukemia and lymphatic leukemia, and lymphosarcoma of the thymic gland. The regression of these tumors following the administration of the roentgen therapeutic test dose is spectacular. They completely "melt away" within two or three weeks after treatment.

Group II is made up of tumors containing predominantly reticulo-endothelial or embryonal spindle-cell elements, such as mediastinal Hodgkin's disease, reticulum-cell sarcoma, endothelioma, and embryonal spindle-cell sarcoma. The rate of regression of these tumors is moderate. After two weeks there is a 25 per cent reduction in size, after six weeks a reduction of 50 per cent or more, and after three months nearly always complete disappearance. A second series of radiation therapy is often given after a six weeks' period, as a rule with considerably less dosage.

Group III is composed of other malignant tumors of the mediastinum, such as fibrosarcoma, melanosarcoma, carcinoma of the thyroid and thymic glands, teratoma, etc. The rate of regression of these tumors is slow. After two weeks, there is hardly any reduction in size; after six weeks there is a 20 to 50 per cent reduction, and after three months in the majority of the cases there is again progression. In some instances, further intensive irradiation results in a notable prolongation of life or even a five-year survival.

Group IV consists of benign tumors of the mediastinum, such as neuroganglioma, dermoid cyst, chondroma, fibroma, lipoma, etc., and pseudo-tumors, such as aneurysm, encysted fluid, encapsulated abscess, and echinococcus cyst. These lesions are uninfluenced by the therapeutic test dose, with the possible exception of the large fibroma, which seems to behave in a manner similar to that observed in large uterine fibroids. In this group the irradiation must be carried out with great care so as to avoid any injury to the normal structures. Not a few of these tumors are eventually subjected to delicate surgical intervention, the success of which might be jeopardized by the presence of adhesions and fibrosis of the surrounding tissues and lungs. In none of the authors' cases, however, did any such complications occur.

It appears safe to conclude that the application of the roentgen therapeutic test dose is of great value in Groups I and IV and to a lesser extent in Group III. It permits a close enough initial differentiation in most mediastinal tumors so that the radiation therapy can be continued with successively adjusted doses until the course is properly concluded. In the authors' series, a correct diagnosis was eventually made in more than 90 per cent of the cases.

This paper is profusely illustrated and many case reports are given exemplifying the various types of cases encountered in the four groups described. End-results of treatment are given in these case records. Seventy-three cases are reviewed, covering the period from 1922 to 1936, inclusive.

CLARENCE E. WEAVER, M.D.

NON-NEOPLASTIC CONDITIONS

Roentgen Therapy of Diphtheria Carriers. A. J. Williams and T. M. Fullenlove. Am. J. Roentgenol. **47:** 766–770, May 1942.

Having defined the important types of diphtheria carrier—the persistent and intermittent—and touched upon the methods for their detection, the authors review briefly the various methods of treatment. The aim of all therapeutic procedures is elimination of the organism by restoration of the diseased mucosa to normal and immunization of the patient to the Klebs-Loeffler bacillus.

As has been shown earlier by Desjardins (Radiology **32:** 699, 1939) and Hodges and Berger (J. A. M. A. **107:** 1551, 1936), the natural process of resistance to infection is accelerated by roentgen irradiation. The accumulation of old lymphocytes and leukocytes is destroyed and new cells are allowed to enter the field. Phagocytosis by the reticulocytes is stimulated, probably by opsonins or other factors liberated by the destroyed lymphocytes. As a result, the hypertrophied and chronically inflamed lymphoid tissue is shrunken and dissolved.

The authors report 9 cases, in all of which roentgen therapy proved of benefit. The nasopharynx was irradiated through two lateral fields, treatments being given through each on the same day and repeated with intervals of a day until three treatments were given. When cultures remained positive, the series was repeated in a week. The factors were: 200 kv., 50 cm. target-skin distance, half-value layer equal to 1.0 mm. copper, 10 per cent of an erythema dose to each field. In those cases which received two courses, only 60 per cent of an erythema dose was given in all, over a period of three or four weeks. The total dosage required is so small that even the most protracted treatment necessary is not attended by the slightest danger.

The authors conclude that carriers of all types should be treated by roentgen irradiation because of the possibility that one type can develop into another more chronic type. Immunization should be continued as at present, and its use spread to cover adults who are carriers and who are Schick positive.

A bibliography is appended.

Tuberculosis of the Breast Treated with Roentgen Irradiation. S. Richman. Am. J. Roentgenol. **47:** 771–774, May 1942.

Tuberculosis of the breast is a rare disease. Lee and Floyd (Ann. Surg. **99:** 753, 1934) in 1934 collected from the literature 399 proved cases, of which 234 were classified as primary. Only one paper could be found by the author dealing with the treatment of the disease by roentgen irradiation—that of Glauner (Röentgenpraxis **8:** 38, 1936. Abst. in Radiology **27:** 383, 1936), who reported 3 cases. Two other cases are mentioned—one referred to by Holfelder in a discussion of Glauner's paper and one mentioned by H. Goldberg in a personal communication to the author. An additional case is recorded here.

The patient was a young colored woman with abscess formation in the left breast and a mass of firm nodes in the left axilla. The diagnosis was proved by biopsy. Radiation therapy was instituted on Oct. 2 1939. The physical factors employed were: 200 kv., 20 ma., 0.5 mm. Cu plus 1.0 Al filter (half-value layer 0.89 mm. Cu), and 50 cm. focal-skin distance. The entire left breast was irradiated through two tangential fields, mesial and lateral, each measuring 17 by 15 cm. The axillary lymph nodes were treated at first by using 10 by 15-cm. portals, but as the nodes decreased in size, these were reduced to 8 by 10 cm. The dose per field was 75 to 100 r, measured in air, at weekly intervals.

On Oct. 13, 1939, the wound in the breast looked much cleaner. On Feb. 19, 1940, four months after treatment was started, the axillary lymph nodes were barely palpable, but there was still some induration in the left breast. There was a recurrent draining sinus, 1.0 cm. in diameter, in the left mid-axilla noted on April 11. This healed three months later but recurred again in one month. After additional irradiation to this region, the sinus finally healed at the end of two more weeks. The last roentgen treatment was given in August 1940.

Twenty-nine months after treatment the patient was still well.

The author advocates biopsy in persistent abscesses and recommends roentgen therapy as a conservative and successful procedure in mammary tuberculosis.

RADIATION EFFECTS

Changes in the Hypophysis Following Roentgen Irradiation of the Testes. C. A. Joël. Schweiz. med. Wchnschr. **72:** 795–796, July 18, 1942.

Studies of the hypophysis following doses of radiation to the testes of 60 to 2,400 r were undertaken because of disagreement in the literature as to the changes following this procedure. With a dose of at least 1,050 r, changes appear in the hypophysis characteristic of castration. With this dose only the stem cells are left in the tubules. After discussing at some length the correlation between these changes and the clinical evidences of secondary sex characteristics, etc., the author concludes that "the deficiency of seminal epithelium is responsible for the changes in the hypophysis, and therefore the seminal epithelium is to be attributed an endocrine function." LEWIS G. JACOBS, M.D.

Fibrosis of the Lung Following Roentgen Irradiation for Cancer of the Breast. A Clinical Study. J. E. Leach, J. H. Farrow, F. W. Foote, Jr., and N. W. Wawro. Am. J. Roentgenol. **47:** 740–747, May 1942.

Of 347 patients receiving high-voltage irradiation for breast cancer between 1926 and 1936 and alive after five years or more, 77 (22.1 per cent) gave roentgen evidence of pulmonary fibrosis. Though the general opinion is that fibrosis is more prone to develop in elderly persons, the mean age of these patients was forty-six years and some of the most severe cases occurred in the thirties.

Pulmonary fibrosis following irradiation is of insidious onset, often appearing many months after treatment. Its chief symptoms are a persistent, slightly productive cough, dyspnea on exertion, and fatigue. Hemoptysis, pain, and palpitation are of less frequent occurrence. Classically, deviation of the trachea, retraction of the mediastinum to the affected side, diminished thoracic expansion, impaired percussion note, and high-pitched tubular breath sounds are easily recognized. Though it has been stated that right-sided heart failure may result from irradiation fibrosis, the authors have found no instance of this in uncomplicated cases. When the mediastinum is markedly displaced and fibrotic, right heart failure may occur not because of the pulmonary scarring, but because of angulation of the pulmonary vessels with resultant right ventricular strain, hypertrophy, and finally dilatation. No significant correlation was found in this series between the amount of radiation received by the lung and the symptoms, signs, or degree of fibrosis.

The dyspnea associated with fibrosis is attributed to a decrease in vital capacity due to subtraction from the total pulmonary volume by the fibrosis itself; to the immobility of the chest wall, due in part to the mastectomy scar; to a compensatory emphysema of the non-fibrotic lung tissue, and to an increase in the irritability of the inspiratory and expiratory pulmonary reflexes of Hering and Breuer which seriously alters the normal rhythmic action of the entire sequence of pulmonary reflexes.

While no means is known of favorably affecting the diseased lung or modifying the fixity of the chest wall, the authors have found that a suitable abdominal belt may relieve the dyspnea, in some cases actually increasing the vital capacity and in others forcing the patient to use the lower, larger portion of the chest for respiration, putting the upper, more diseased portion at relative rest, thus diminishing the irritable Hering-Breuer reflexes and increasing the total air. Weight reduction is also of importance, either alone or in conjunction with the wearing of an abdominal belt.

Microcephaly Following Maternal Pelvic Irradiation for the Interruption of Pregnancy. D. P. Murphy, M. E. Shirlock, and E. A. Doll. Am. J. Roentgenol. **48:** 356–358, September 1942.

Therapeutic roentgen and radium exposure of the fetus *in utero* results in a great percentage of congenitally malformed infants, the most frequent abnormality being microcephaly. For this reason the authors advise against exposure of the fetus to therapeutic radiation. To prevent accidental exposure a curettage should precede pelvic irradiation and the patient should be warned about the danger of becoming pregnant during a course of therapy. If pregnancy should occur or if abortion is attempted by irradiation and fails, the uterus should be emptied.

No evidence has been shown that roentgen and radium irradiation of the ovaries prior to conception or diagnostic radiation of the fetus *in utero* produces any damage.

A case is recorded of the birth, at term, of a microcephalic child, following pelvic irradiation in the third month of gestation for the purpose of producing abortion. S. M. ATKINS, M.D.

Discussion on the Effects of Occupational Exposure to X-Rays and Radioactive Substances. J. Nuttall *et al.* Proc. Roy. Soc. Med. **35:** 716–722, September 1942.

This is an abridged account of a discussion by Dr. John Nuttall, Dr. J. C. Mottram, Prof. Sidney Russ, and Dr. Janet M. Vaughn on the harmful effects of exposure to radiation, a danger that it is pointed out may be increased under the conditions of war.

Doctor Nuttall mentions one observation that has received little or no attention, namely, the phenomenon of radiation tiredness, characterized by undue physical and mental fatigue and irritability. While this seems to be associated with exposure to too great an amount of radiation, it is not constant in all workers, and Nuttall believes that it is modified by conditions of temperature and ventilation.

The one early sign of over-exposure common to all workers is absolute and progressive leukopenia due to neutropenia. This, if unchecked, may reach serious proportions.

As protective measures, Nuttall mentions a wider application of rotation of duties, so that exposure to radiation is limited to a few weeks at a time, with intervals of safer duty, and the "dilution of exposure," by spreading the potentially dangerous work among a large staff. Such rotation and dilution he regards as "of just as great importance as distance and lead shields."

Doctor Mottram discusses in some detail the effect of of radiation on cell mutations, particularly as it affects men and women engaged in roentgenography and radiotherapy, and their offspring. His conclusion is that a few hundred roentgens to ova or sperm is a

risk to be avoided from the point of view of producing dominant deleterious mutations, and that female workers with radium and x-rays can easily accumulate such a dose over a number of years.

Professor Russ is concerned chiefly with the harmful effects of radioactive substances as encountered in industrial and technical processes. He points out more particularly the dangers incident to the presence of radium in the atmosphere. Quoting various observers, he suggests that 10^{-10} curie per liter of expired air may serve both as a danger signal for an atmosphere of radon and as a much more serious sign of a deposit of radium in the body. Under these conditions an operative should be taken off all radioactive work.

Doctor Vaughn distinguishes between external and internal radiations from the point of view of harmful effects. Her conclusions are as follows:

(1) External radiations from x-ray or radium do not present an occupational hazard to workers starting with a normal blood picture provided normal and adequate protective precautions are observed. (2) Severe and fatal blood dyscrasias may result from handling radioactive substances, the most common being a megalocytic hyperchromic type of anemia, dependent upon internal irradiation by alpha particles following ingestion (as when painters of luminous dials lick their brushes). (3) Individual idiosyncrasy is probably of some importance in the development of blood changes following exposure to x-ray and radioactive substances, as it is with other occupational blood dyscrasias. STEPHEN N. TAGER, M.D.

Effect of Roentgen Rays upon the Growing Long Bones of Albino Rats. Quantitative Studies of the Growth Limitation Following Irradiation. C. L. Hinkel. Am. J. Roentgenol. **47:** 439–457, March 1942.

A series of experiments is recorded which were designed to determine quantitatively the radiosensitivity of rat bone and cartilage throughout the period of active growth and to show the influence of age upon the effect produced. Albino rats were used and the radiation (200 kv., 25 ma., 50 cm. distance, 0.5 mm. Cu and 1.25 mm. Al filtration) was applied to a small field located on the anteromesial aspect of the right hind leg in such a position as to include the distal femoral epiphysis. The left femur of each animal was not irradiated and was used as a control.

Normally 73 per cent of the postnatal femoral growth in albino rats takes place at the distal extremity of the bone, which is comparable to observations on the human femur. Following irradiation, various degrees of stunting were observed, depending on the dose and the age of the animal. The amount of radiation required to produce minimal stunting was found to bear a linear relationship to age. Similarly recovery from the injury produced was influenced by age, being much more active in the young, rapidly growing rats. Young animals were found to regain growth function in epiphyseal regions subjected to several times the minimal stunting dose. When older animals were given comparable overdoses, growth was permanently abolished.

Months after irradiation with large doses, there is no evidence of bony decalcification as determined by bone ash percentage values. Microscopic studies show a return to normal cartilage and bone architecture, and absence of permanent marrow or blood vessel injuries in young animals.

The author suggests the possibility of the clinical application of these observations when dealing with unequal extremities and includes a reference to Spangler's work, published while the present studies were being made (The Effect of X-ray Therapy for Closure of the Epiphyses, with a Report of 4 Cases. Radiology **37:** 310, 1941).

Comparison of the Action of X and Gamma Radiation on Fibroblasts. E. Paterson. Brit. J. Radiol. **15:** 257–263, September 1942; 302–306, October 1942.

Experiments upon tissue cultures were run to determine whether any real difference exists between the effects of roentgen and gamma rays on fibroblasts *in vitro*. The tissues used were fibroblasts from the choroid and sclerotic layer of the chick eye, cultivated by the hanging drop method. The dose and the dosage rate in all experiments were kept constant. The rate of x-ray irradiation was kept at 53.6 r/min. Constant voltage was maintained at 230 kv. The filter was 1.0 mm. Cu plus 1.0 mm. Al; the half-value layer was 1.6 mm. Cu. The dosage rate for gamma rays was calculated, using the value 8.4 r per hour at 1 cm. from a point source of 1 mg. filtered by 0.5 mm. Pt. The dosage rate was equalized at 53.6 r/min. by varying the distance from the plane of the cultures.

The qualitative effects of both types of radiation were the same. The tissues showed a loss of axial direction of growth, numerous abnormally large cells appeared, there was diminution in the quantity of outgrowth from the cultures, and there was a decrease of mitotic activity. With low doses recovery occurred early and was complete. With larger doses recovery occurred later and was not always complete. Immediate death of a culture was never observed. Dosages ranged from 2,000 r to 15,000 r, apparently measured in air.

Quantitatively the effect of x-ray was consistently greater than that of gamma rays; the death rate being about four times as high with x-rays at 2,000 r. With dosages of 15,000 r the death rate was nearly equal. This result was obtained when irradiating on glass cover slips.

The apparent quantitative difference raised the question of whether or not the effect of x-radiation on cells might be influenced by the atomic number of the substances in intimate propinquity to the cells. This question was investigated in two further sets of experiments, one with cover slips of gold, and the other using paraffin or a plastic material of low atomic number. The conditions of irradiation remained the same as before. The quantitative differential in favor of x-rays was present in the experiments conducted with the gold cover slips. With cover slips of low atomic number, such as the plastic or paraffin, the gamma rays were slightly more effective than x-rays, but the difference was not enough to be significant.

These experiments show that with one test material and the same technic of irradiation, variable quantitative results may be obtained depending upon the nature of the substance in close proximity to the cells, although the qualitative effects are the same. X-rays are apparently more lethal when the cultures are irradiated on glass or gold, and there was no

significant difference when the surrounding medium had a low atomic number. It is therefore assumed that the difference is due to an alteration in the amount of ionization in and around the irradiated tissue.

SYDNEY J. HAWLEY, M.D.

Studies of the Effects of Million Volt Roentgen Rays, 200 Kilovolt Roentgen Rays, Radioactive Phosphorus, and Neutron Rays, by the Marrow Culture Technique. E. E. Osgood, P. C. Aebersold, L. A. Erf, and E. A. Packham. Am. J. M. Sc. **204:** 372–381, September 1942.

This paper presents data, obtained by the method of human marrow culture, on the comparative effectiveness of million volt roentgen rays, 200 kv. roentgen rays, neutron rays, and beta rays emitted by radioactive phosphorus.

An exposure to 200 r of 200 kv. roentgen rays had similar effects to an exposure to 200 r of million-volt roentgen rays on lymphocytes. An exposure to 50 n of neutron rays had similar effects to an exposure to 200 r of roentgen rays at a million volts or at 200 kv. An exposure to 15 n of neutron rays had similar effects on both lymphocytes and progranulocytes to an exposure to 60 r and 400 r, respectively, of roentgen rays at 220 kv. The exposure ratio, r/n, for lymphocytes and progranulocytes in marrow cultures is approximately 4. One microcurie average of radioactive phosphorus distributed through 1 c.c. of human marrow culture acting for a period of twenty-four hours has an effect similar to 35 r of high-voltage roentgen rays on lymphocytes and progranulocytes.

It has also been shown in interchange of media between irradiated and non-irradiated marrow cultures that there is no evidence of an indirect action of the roentgen rays, but the effects could all be explained if the action of the irradiation was directly on those cells capable of mitotic or amitotic division to inhibit the onset of division.

BENJAMIN COPLEMAN, M.D.

Some Physiological Changes in the Skin Produced by Neutrons. J. C. Larkin. Am. J. Roentgenol. **47:** 733–739, May 1942.

This paper from the Crocker Radiation Laboratory describes the physiological reactions of the skin to neutron radiation produced by the 60-in. Berkeley cyclotron.

In normal skin the scratch test, in which a pointed object is drawn over the area to be studied, produces first a white line, due to the mechanical stretching of the endothelial tubules in the skin. This is followed by the appearance of a red line, due to the liberation of a chemical substance generally believed to be similar to histamine produced by injured cells, and a subsequent more diffuse reddening, or flare, attributable to a dilatation of the arterioles in response to a nervous mechanism. In the presence of factitious urticaria there appears, instead of the normal white line, a narrow band of local edema, or wheal, resulting from an outpouring of fluid by the minute vessels into the interstitial spaces, causing pressure on and collapse of the vessels.

Injection of a drop of histamine solution (1:300) produces a reddening of the normal skin due to vasodilatation, with a raised edematous wheal in its center. Adrenalin or pituitary extract, on the other hand, produces a constriction of the skin capillaries, but this effect is easily overcome by the more powerful action of histamine.

Applying the tests described above to areas of erythema due to neutron irradiation, the author made the following observations:

"The scratch test in erythematous areas shows a persistent white reaction compared to control areas, indicating an increased sensitivity of the endothelial tubules.

"The scratch test in erythematous areas in individuals with factitious urticaria shows little or no wheal formation. This indicates that the erythematous skin is refractory to histamine action.

"On injecting histamine 1:300 into erythematous fields there is no wheal formation. The failure of wheal formation in erythematous skin is then apparently not due to the absence of histamine but to the refractoriness of the area. This failure cannot be due to just congestion, as on injecting vasoconstrictive substances to obliterate it there is still no wheal formation.

"Vasodilative substances are not formed during the latent period before the erythema is seen, as there is no elevation of skin temperature measured by the thermocouples.

"There is a marked rise of skin temperature indicating vasodilatation after the erythema is seen.

"The mechanism responsible for constriction of minute vessels in erythematous areas is still sensitive to vasoconstrictive substances in spite of the erythematous reaction, as is shown by the blanched areas after adrenalin is injected. The dilatation of the minute vessels is then a reversible reaction.

"The nervous mechanism controlling flare formation is not affected by irradiation."

Observations on the skin of patients returning for check-up examinations suggested adequate revascularization of the areas involved.

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